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WATER RESOURCES PROGRAM

SUSQUEHANNA RIVER BASIN COMMISSION

ADOPTED
November 13, 1975

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Figure 1 SUMMARY INDEX OF WATER RESOURCES PROGRAM [illegible]

Agencies		States				Federal Government									
						DEF.	Interior			COM.	AG.	EPA	HUD	FPC	DOT
Work Program Area	SRBC	N.Y.	PA.	MD.	LOCAL	COE	GEOL. SUR.	BOR	FISH & WIL	NWS	SCS				
FLOOD PLAIN MANAGEMENT AND PROTECTION															
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PART I

THE FRAMEWORK

CHAPTER ONE: THE PLANNING PROCESS

Section A - Authority for the Water Resources Program

The Water Resources Program represents an important step in water resources management in the Susquehanna River Basin. The Susquehanna River Basin Commission is required, under Sections 3.3 and 14.2 of the Compact, to:

> "...annually adopt a water resources program, based upon the comprehensive plan, consisting of the projects and facilities which the commission proposes to be undertaken by the commission and by other authorized governmental and private agencies, organizations, and persons during the ensuing six years or such other reasonably foreseeable period as the commission may determine. The water resources program shall include a systematic presentation of:
>
> 1. The quantity and quality of water resources for such period.
>
> 2. The existing and proposed projects and facilities required to satisfy such needs, including all public and private projects to be anticipated; and
>
> 3. A separate statement of the projects proposed to be undertaken by the commission during such period."

Section B - The Planning Process

The Water Resources Program is one of essentially four planning elements by which the Commission intends to

1 carry out its responsibilities and duties with respect to
2 the multi-objective management of the Basin's water and
3 water-related natural resources. The other planning ele-
4 ments are the Comprehensive Plan, Review of Projects, and
5 Intergovernmental Relationships; all provided for in Com-
6 pact Sections 14.1, 3.10 and 12.1 et seq., respectively.

7 The Comprehensive Plan, adopted in December 1973,
8 is the strategy for the immediate and long-range conser-
9 vation, development, use and management of the water re-
10 sources of the Basin. It consists of three general areas.
11 The first is Program Areas, Objectives, and Goals to guide
12 program development for the Commission, other agencies and
13 the private sector. Several broad areas of water resources
14 concern have been identified: Flood Plain Management and
15 Protection; Water Supply; Water Quality; Recreation, Fish
16 and Wildlife; Watershed Management and Protection; and Cul-
17 tural, Visual and Other Amenities. Within each program
18 area, broad objectives and specific goals are set forth.
19 The second area is the Guidelines and Criteria which aid in
20 establishing a sound basis for decisions among alternatives
21 or competing uses of Basin water resources, and form major
22 considerations upon which the Commission will evaluate pro-
23 posals of Federal, State, local and private sectors. The
24 intent of the third area, the Early Action Program, is to
25 translate certain program objectives and goals into program

1 and project recommendations. Based upon the Commission's
2 priorities for meeting needs, the Early Action Program pro-
3 vides a five-year perspective which identifies courses of
4 action and assigns the appropriate government agency, includ-
5 ing the Commission, responsibility for meeting these needs.

6 Project Review is the process whereby certain classes
7 of programs and projects come before the Commission for eval-
8 uation and approval prior to being undertaken. It generally
9 requires the Commission to review diversions, projects which
10 would have a significant interstate effect, any physical fa-
11 cility on or crossing the boundary between any two signatory
12 states, projects identified in the Comprehensive Plan, pro-
13 jects committing water for longer than ten years, and pro-
14 jects with a life expectancy of greater than ten years which
15 satisfy a water resources related need. The Rules and Regu-
16 lations for Project Review were adopted in the fall of 1974
17 and became effective June 1, 1975.

18 Intergovernmental relationships are those activities
19 necessary for Federal, State, and local government units to
20 insure the proper relationships among all agencies involved
21 in water resources planning and management in the Basin. It
22 requires cooperative planning between the Commission and
23 other agencies for projects and programs related to the powers
24 delegated the Commission under the Compact. One of the more

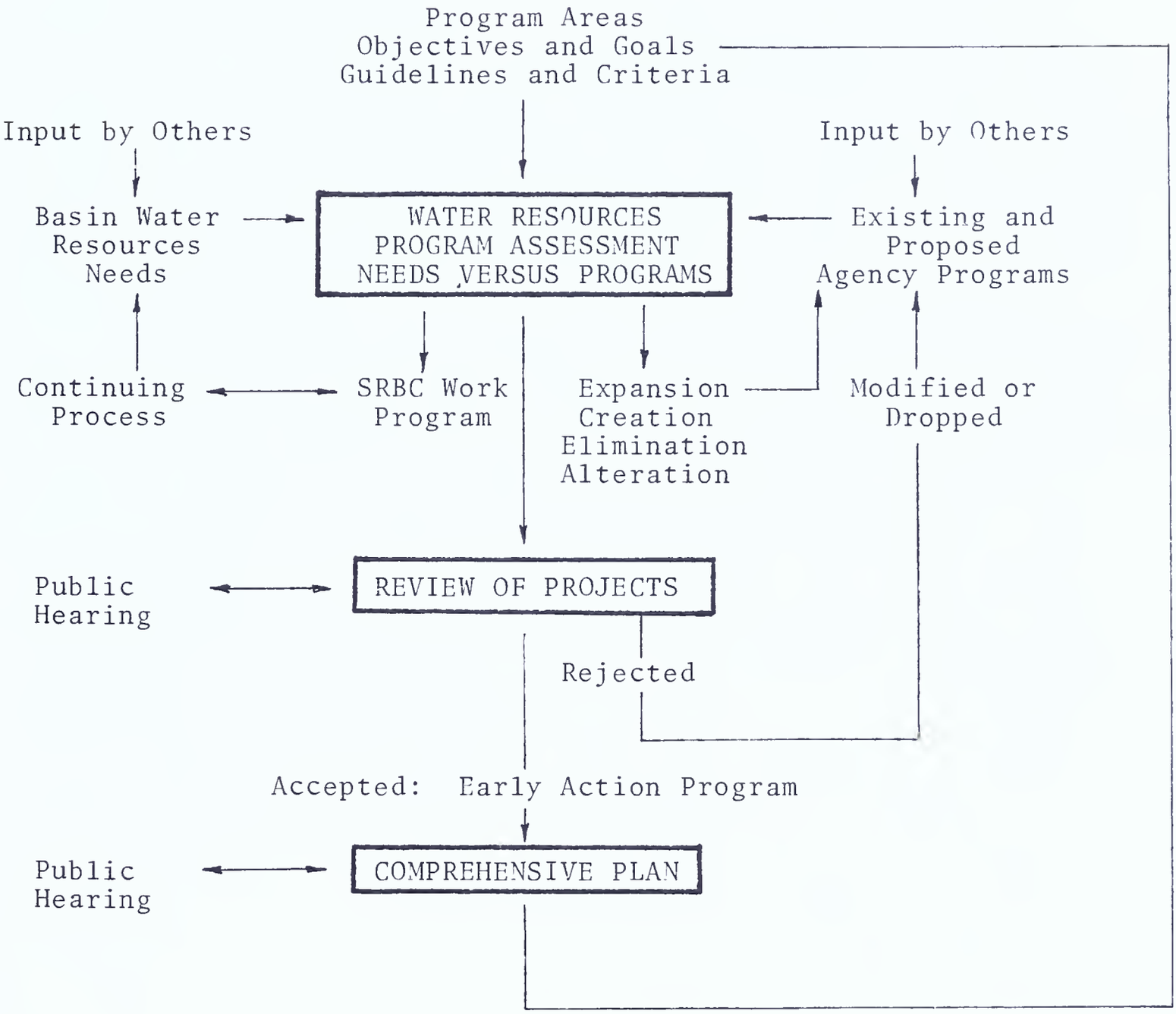
significant activities is the establishment of Interagency Memorandum of Understanding between the Commission and other agencies. Through these Memoranda, duplication of work, specifically relating to review of projects, can be avoided and more effective and efficient management of water resources will be achieved.

A flow chart of the planning process is presented in Figure 2. From it the relationship of the four elements can be seen. This process is designed to be dynamic, requiring continuing input and updating to reflect changes in priorities and conditions, new data, technologies, and policies. The Comprehensive Plan defines broad program areas, long-range objectives and immediate goals. It sets forth general guidelines and criteria that shape the Water Resources Program. The Water Resources Program provides a forum for identifying and coordinating needs and agency programs to guide project and program development within other agencies and the Commission. The inclusion in the program of future studies and projects within a five-year framework and its annual updating provides the Commission with an opportunity to both review and participate in specific program development from program inception to project implementation. The continuing evaluation of needs versus agency programs will direct the Commission work programs to areas where the Commission can function

FIGURE 2

THE PLANNING PROCESS

Intergovernmental Relations Are Represented
By The Lines of Action



most effectively. The program also provides the earliest opportunity for other agencies to bring their projects and programs in contact with the Commission's planning process. In this manner, projects and programs can be followed, and when appropriate submitted to the Commission for Project Review. Upon approval, a project will be included in the Early Action Program of the Comprehensive Plan.

Through the planning process, input from other agencies, private citizens, industry, special interest organizations, etc., will be solicited as part of intergovernmental relationships. This input will then be evaluated and used to affect the other three elements such that the views of all segments of the Basin populace are accurately represented.

The open and flexible nature of this planning process will hopefully serve to maintain and improve the Commission's ability to deal with the changing realities and requirements of water resources management. It should be remembered though that planning is not an end in itself. The validity of a planning process depends directly on the relevance of its information, values and analyses to the overall context of decision-making within which the Commission operates. The structure of the planning process may be subject to adjustment with changes in the goals of water resources management and the values of society.

CHAPTER TWO: THE WATER RESOURCES PROGRAM

This chapter discusses the scope, function and development of the Water Resources Program.

The program separately addresses each of the six program areas. Within each area, five sections are presented -- Needs Determination, Existing and Planned Programs, Assessment, and Recommended Programs.

The development of the Water Resources Program is both a summary and a prescriptive activity as it brings into focus the complex interaction of water resource needs and measures designed to meet those needs throughout the Susquehanna River Basin. It is a summary in that it presents in a concise form, an annual account of the status of water resources management. It is prescriptive as it evaluates current program activity and recommends continuation or changes in programs and priorities, and in planning and policy directions. The methodology used emphasizes broad program area formulation rather than projects, because in that way planning for the future can be most effective. However, as program areas proceed from early planning stages toward development, projects or specific elements of a program will be identified through the Water Resources Program for review and action. The program will also aid the Commission in identifying long-range goals and planning activity necessary to fulfill the Comprehensive Plan.

The comprehensive portrayal of needs and planning programs will be of value to governmental agencies and the public as a source of information on water resources management in the Basin, and as a guidance tool in planning and program development. The program thus serves as a primary means by which the Commission will meet its responsibility to "promote and aid the coordination of the activities and programs of Federal, State, municipal, and private agencies concerned with water resources administration in the Basin".[1] In fact, the Commission is dependent upon other governmental agencies and private interests for current and accurate information on their activities, thus providing a significant amount of the data contained in the Water Resources Program. By bringing together the range of studies, plans and projects being undertaken throughout the Basin, the program will aid the planning activities of the many water resource agencies.

This discussion of each program area considers five sections or steps, as listed above. The development of each section is a necessary and crucial task. The first two -- Needs Determination, and Existing and Planned Programs -- generally portray the current condition of the Basin's water resources and management activities. Based upon this knowledge, an Assessment follows in which the existing and proposed programs

[1] Compact, Section 3.7

are evaluated in terms of their effectiveness in meeting the needs. This step then leads to the formulation of Recommended Programs which prescribe new measures or changes in existing activities that are required to meet the Basin's needs. A separate section presents the anticipated Commission activity within each program area.

The following discussion outlines the contents of each section in the following chapters on program areas.

Needs Determination

The term "needs" refers to two kinds of statements of need. The first need is quantitative information which describes resource conditions relating to the quantity and quality of water and related resources, and the quantity and quality of activities which impact upon these natural resources. Examples of this kind of need are flood damage figures, number of miles of surface water degradation, projected water supply demands, acreage of land with erosion and sediment problems, etc. The recommended programs section is the translation of needs into descriptions of measures or programs required to correct and/or improve resource conditions. The need may be identified, for example, as structural or nonstructural measures to reduce flood damages, or as pollution abatement programs to improve water quality.

1 The range of water resource concerns requires appli-
2 cation of a variety of methodologies for the quantitative
3 determination of needs which are reasonable and appropriate
4 to the subjects. To aid and improve water resources manage-
5 ment, an agreement or consensus should be reached by the con-
6 cerned agencies on a methodology to be used within each water
7 resource area such as that described in the Water Resources
8 Council's Principles and Standards. As needs determination
9 provides the basis for planning activity, coordination among
10 agencies on this point is of primary importance.

11 At the present time, the Commission is exploring the
12 most satisfactory approach to needs determination. Many
13 studies have been previously undertaken to assess the water
14 resources needs within the Basin. Three of these studies should
15 be mentioned. In the 1960's, a joint Federal and interstate
16 committee compiled, for the first time, basinwide resource
17 data and needs, and recommended projects and facilities to
18 meet these needs. This study by the Susquehanna River Basin
19 Coordinating Committee was completed in 1970. The North At-
20 lantic Regional Water Resources Study, a joint planning ef-
21 fort of 25 Federal, State and regional agencies, was completed
22 in 1972 and is basically a framework or guidance document.
23 The North Atlantic Division of the Army Corps of Engineers is

1 currently involved in a study of the Northeastern United
2 States Water Supply (NEWS). Southcentral Pennsylvania has
3 been identified as an area in urgent need of water supply
4 development. A preliminary study of alternatives has been
5 completed. In addition, the NEWS Study evaluated the water
6 supply demand and capacity of five urban metropolitan areas
7 in the basin. More information is provided on these two ef-
8 forts in the chapter on Water Supply.

9 There have also been numerous studies by State, regional
10 and municipal governmental agencies. Though there are con-
11 straints in the usefulness of these studies, the Commission
12 recognizes the value of these efforts in providing data and in
13 highlighting particular resource conditions. These studies and
14 sometimes valuable technical appendices will be carefully
15 evaluated in terms of assisting the Commission in formulating
16 Basin needs on a multi-objective basis. In this light, there
17 are several major planning activities currently underway which
18 will contribute to more precise definitions of needs and of
19 alternative management solutions. Pennsylvania's State Water
20 Plan, the Chemung River Basin Regional Water Resources Plan-
21 ning Board Plan, and the Eastern Susquehanna River Basin Re-
22 gional Water Resource Planning Board Plan each address a
23 range of resource objectives and will be described further in
24 Chapter Three. The Army Corps of Engineers' Flood Control
25 Review Study, discussed in Chapter Two, will address the need

for structural and nonstructural measures to reduce flood damages.

As a common base for determining the various resource needs, the Commission will utilize the population, employment and economic data provided in the U.S. Water Resources Council's 1972 OBERS Projections (published in April 1974). The range of alternative population projections within the OBERS series will permit flexibility in the Commission's planning process. Other factors which influence demand projections include national economic growth rates; distribution of population; municipal, industrial and agricultural rates of water use; government policies; and changes in technology. There are, in addition, more specific factors within each resource area which serve as input into needs determination and projections of future demands.

Needs determination and interactions on a basinwide basis is a new way of planning to many agencies. Political boundaries and enabling legislation have traditionally limited most agencies in both scope of planning and implementation. Time will be required to expand agency planning considerations to insure that basinwide concerns are recognized. The Commission, meanwhile, faces the task of integrating the already established planning activities, data and concerns of the dif-

ferent levels of government and the private sector within a basinwide concept of water resources management. The exchange of information on water resource needs among the different parties will aid in the development of an effective basinwide planning framework.

Existing and Planned Programs

This section is developed as a product of continual coordination and communication with agencies or groups which directly or indirectly affect water and related natural resources. An annual update will provide an opportunity to monitor the progress of programs and projects, and allow an agency to assess the possible need for interaction with other agencies concerning a particular project (e.g. review, funding, etc.). The inventory represents, essentially, the supply side of water resources management.

Assessment

While the Compact does not require that the Water Resources Program evaluate existing and planned programs, it is essential to the process of developing specific strategies to properly deal with resource needs and problems. The assessment is generally based upon three factors - the objectives and goals as established in the Comprehensive Plan and other Commission policies; the current and projected needs; and the ongoing and proposed programs. With this information, the as-

sessment points out the extent of progress that is being made toward meeting the Basin's needs. It draws attention to the work which remains to be done and lays the foundation for the specific recommendations which follow.

Recommended Programs

Following the evaluation of current planning activities, specific recommendations are set forth relating to changes in the substance, priorities, or funding of existing programs; the formation of new program areas; and more effective implementation of programs and projects.

In recognition of the authority, technical expertise and funding capability of the various agencies, the responsibility for planning, implementation and funding of the recommendations will be assigned to the appropriate agency or agencies.

PART II

THE 1976 WATER RESOURCES PROGRAM

Introduction

This first Water Resources Program is a provisional form of the Water Resources Program as required by the Compact. This initial program deals primarily with three of the more crucial areas of water resources planning in the Susquehanna River Basin - Flood Plain Management and Protection, Water Supply, and Water Quality. A brief overview of each of the remaining program areas - Recreation, Fish and Wildlife; Watershed Protection and Management; and Cultural, Visual and Other Amenities - is presented which will generally describe the present and potential role of the Commission in these areas.

The decision to submit a partial Water Resources Program is based on the recognition of the present limits of the Commission's knowledge and experience, and the urgent nature of the problems of flood damage reduction, water supply and water quality.

It is important to note that development of this first year's program differs significantly from the procedures outlined in the preceding chapter. The quantitative basis for needs determination is limited. Even with this constraint,

it is felt that the program needs which are identified are appropriate and justified. The section which describes existing and planned programs deals primarily with other agencies'existing programs and ongoing activities, and does not represent the Commission's five-year work program. It was developed by means of a survey of available literature and direct communication with agency personnel and will be enlarged over the next year to include the schedule of future programs. The first assessment is elementary, not as thorough or as precise as it eventually will be, since both the data and the criteria necessary for an in-depth evaluation are limited. Recommended programs include mainly general suggestions or guidelines for agency planning. Since the Commission is more familiar with its own planning efforts, this Water Resources Program is most specific in the recommendations which will direct the Commission's succeeding work programs.

The Commission expects to initiate a process for the annual development of the Water Resources Program by the presentation of this program, which will result in effective and coordinated planning by local, regional, State and Federal agencies. This process can then be applied throughout the next year, to all areas of Commission responsibility. Based on the material gathered in this first program the Commission will be in a better position to develop its work program for

the following years. A strong need for planning coordination is immediately evident. Through satisfying this coordination need, succeeding programs will reflect increased planning participation by the Commission relative to programs of other agencies.

* * * * * *

There are at present, four broad-based, multi-objective planning or planning-related efforts underway within the basin. Since various aspects of these efforts will be mentioned throughout the remainder of the Water Resources Program, Chapter One will briefly outline their nature, scope and progress. More detailed information can be obtained from the responsible agency. Chapters Two through Five address the program areas.

CHAPTER ONE: MULTI-OBJECTIVE WATER RESOURCE ACTIVITIES

This chapter briefly describes the major ongoing planning activities that address a multiplicity of resource objectives and that seek to develop a comprehensive set of programs and measures to resolve both immediate and long-range problems and needs. The following efforts will be dealt with generally here, and more specifically in later chapters: the Pennsylvania State Water Plan, the Chemung and Eastern Susquehanna River Basins Regional Water Resources Planning Boards' Comprehensive Plans, and the U.S. Water Resources Council's 1975 National Assessment.

Section A - Pennsylvania State Water Plan

Pennsylvania Department of Environmental Resources is developing the State Water Plan with contributions and assistance from other agencies. The plan will serve to direct the management of the State's water and related resources; to meet the present and future needs of the people; and to improve the quality of life. For the time period 1975-1990 the plan will identify needs, alternative solutions or solution concepts for the areas of flood control, water supply, water quality management, recreation and environmental management; for the year 2020 the plan will attempt to identify possible long-range problems and needs.

In preparation for the development of the plan DER has established environmental, economic and social goals; planning objectives; standards and criteria; a work program; and a planning methodology. The planning process is being carried out within the 20 sub-basins in the State (nine of which are in the Susquehanna Basin).

The process involves two major stages. Stage I consists of (a) an inventory of water resources data, including hydrologic and demographic information, and supply and demand data; (b) statewide population projection and population allocation to watersheds under different sets of assumptions; and (c) an assessment, through analysis of supply and demand data, of the needs and urgency of particular resource conditions. Stage II consists of (a) an investigation of potential resources including consideration of improved resource management; development of presently undeveloped resources; conservation; and the potential for resource protection and maintenance; (b) the development of alternative solutions and evaluation of social, economic and environmental impacts; and (c) the formulation of a flexible yet definitive State Water Plan.

Sub-basin reports will contain "material on objectives, physical and demographic characteristics of the basin, description of needs and problems for each aspect of water resources, discussion of resources opportunity and alternatives,

and recommended solution concepts based on multi-objectives."[2] A summary of the sub-basin reports will be issued presenting statewide needs and recommended priorities of action. Additional reports to be published as part of the State Water Plan include "Pennsylvania Water Laws and Institutional Arrangements" and "Water Resources Data System (WARDS)."

DER is soliciting public input through the establishment of advisory committees in each sub-basin. These committees are currently involved in the identification of resource needs and problems. The plan will also seek public input and participation at later steps in the process. Stage I of the State Water Plan is expected to be completed by the end of 1975.

Section B - Chemung River Basin Regional Water Resources Planning Board

The Chemung Board, created in 1968 by Steuben, Chemung and Schuyler Counties, has formulated, with the assistance of New York State Department of Environmental Conservation staff, a comprehensive plan for the protection, conservation, development and utilization of the Basin's water resources. (While limited consideration is given to the Pennsylvania portion of the Basin, the plan itself deals only with the Chemung Basin

2 - Department of Environmental Resources, State Water Plan: Planning Principles, Harrisburg, Pennsylvania, 1975, P. 9.

in New York). The Board plan was directed by the public and water resources agencies through the recognition of the need for flood protection, water-based recreation, water quality improvement, water supply for irrigation and natural resource conservation. The plan, once approved by DEC, will serve to direct all governmental agencies and the private sector in the implementation of project measures and management actions.

The Board has developed broad objectives and principles to guide plan formulation and has investigated a wide range of management and development alternatives. Alternative resource strategies were produced for each sub-basin - Cohocton, Canisteo, Tioga and Chemung. Evaluation criteria were established to aid in measuring the probable success of these alternatives in fulfilling the objectives and needs. From an analysis of the sub-basin strategies a set of basinwide alternatives were formulated and a tentative plan selected. Management programs, projects and measures were developed to meet the needs and problems of the Early Action Period - 1974-1980. The plan also identifies potential water and related resources needs and problems through the year 2020. To summarize the major conclusions and recommendations, the following paragraph is taken from the tentative plan:

> "The major recommendations call for integrated management of water and related resources in the Chemung River Basin consistent with the resource management

needs of the entire Susquehanna River Basin. Emphasis is placed in the early action period on measures to reduce flood damage potential by regulating future development of flood plain areas through zoning and building codes, floodproofing of structures and other measures for flood damage reduction. Completion of the construction of Tioga-Hammond and Cowanesque Reservoirs in Pennsylvania is urged as the highest priority. Also recommended for early action are measures for urban water and land management in the Elmira-Corning area, basin water quality management, groundwater management and development, protection of fishery resources and public opportunities to enjoy these resources, protection of valuable wetland areas, and protection of riverine recreation opportunities. The plan recommends project level planning of reservoir sites on Campbell, Twelvemile and Purdy Creeks, and similar studies of a system of potential small recreation lakes which include sites on Baldwin Creek and Birdseye Hollow."

Section C - Eastern Susquehanna River Basin Regional Water Resources Planning Board

The Eastern Susquehanna Board was formed in 1967 by the counties of Broome, Chenango, Cortland, Delaware, Madison, Otsego and Tioga. The Board has followed an approach similar to that of the Chemung Board in developing, with the assistance of DEC staff, a comprehensive plan for the protection, conservation, development and utilization of the water resources of the Eastern Susquehanna Basin. Both the Chemung and Eastern Susquehanna Boards have received considerable public input and feedback in identifying needs and problems, and in formulating resource objectives and alternative strategies.

A tentative plan has been submitted for technical review and sets forth about 50 recommendations for programs, pro-

jects and studies. The recommendations fall generally within the following categories:

1. Basinwide management and implementation of resource programs.
2. Flood plain management and protection.
3. Flood warning and evacuation.
4. Water quality management.
5. Implementation of Binghamton Wastewater Management Plan.
6. Ground water and land use management, with special attention to the Cortland area.
7. Protection and enhancement of fish and wildlife habitat.
8. Water-oriented recreation.
9 Scenic and recreational rivers.
10. Management of existing lakes and reservoirs.
11. Watershed management and land conservation.

The implementation of the Eastern Susquehanna Plan, once approved by DEC, will require the cooperative effort of Federal, State, interstate and local agencies, the public, and the private sector.

Section D - <u>National Assessment</u>

The U.S. Water Resources Council, under provisions of

1 the Water Resources Planning Act of 1964 (P.L. 89-80), is
2 directing the 1975 National Assessment of Water and Related
3 Land Resources. The National Assessment will examine water
4 resources problems and needs throughout the 21 water resource
5 regions in the country. Assessment activities in the Middle
6 Atlantic Region (which includes the Susquehanna Basin) are
7 being conducted by the states and relevant Federal agencies
8 with the Corps of Engineers' North Atlantic Division.

9 The Corps is currently carrying out a problem identi-
10 fication survey, with input from other agencies.

11 The National Assessment has three major objectives:
12 (1) identify and describe the location, extent and magnitude
13 of severe water-related problems caused by a lack of adequate
14 water supplies or conflicts between users; (2) evaluate the
15 economic, environmental and social impacts of not resolv-
16 ing the identified severe problems; and (3) establish
17 priorities, draw conclusions and make recommendations as to
18 the decisions which will be needed to resolve immediate and
19 future problems. The conclusions and recommendations will
20 generally relate to (1) the National interest and Federal role
21 in resolving high priority problems, (2) the need for more de-
22 tailed studies, and (3) the need for additional or modified

data collection and compilation programs to support recommended problem-resolution activities.

The Assessment is expected to be completed by June 1977.

CHAPTER TWO: FLOOD PLAIN MANAGEMENT AND PROTECTION

The history of the public understanding of man's occupancy of flood plains and the attempts to deal with the consequences can be understood by examining the evolving Federal involvement in flood damage reduction.

Widespread flooding in 1935 and 1936 prompted Congress to enact the Flood Control Act of 1936. This was the first significant step toward dealing with the dangers and costs of flooding. Federal responsibility to reduce flood damages was acknowledged and expenditures for structural control were authorized. By 1972, about ten percent of the Susquehanna River Basin's drainage area was controlled by structural measures developed by the Corps of Engineers, Soil Conservation Service, and the Commonwealth of Pennsylvania, with control measures affecting another three percent underway. Structural control was in fact the only means being utilized to significantly reduce flood damages.

The National Flood Insurance Program was established in 1968, but attracted only a relatively small number of municipalities. The opportunity to alleviate the personal financial burden of flooding through the purchase of flood insurance was substantially overlooked. Building codes did not include adequate floodproofing requirements and standards, and ef-

1 forts to flood proof private and public property were quite
2 limited.

3 In 1972, Tropical Storm Agnes dramatically demonstrated
4 the vulnerability to flood damage of the Basin's private and
5 public development on the flood plain. The storm brought
6 most of the Basin's streams beyond flood stage causing un-
7 precedented destruction.

8 Since 1936, two notable advances have been made in
9 the Federal approach to flood damage prevention, both of which
10 will play major roles in the attainment of a comprehensive and
11 effective flood damage reduction program. First, Congress
12 passed the National Flood Insurance Act in 1968, establish-
13 ing a Federally-subsidized program through which in-
14 dividuals can purchase flood insurance for their residences
15 or commercial or industrial buildings and their contents.
16 Municipalities have to meet certain Department of Housing and
17 Urban Development requirements before insurance is available
18 to individuals. The program was intended to decrease the
19 financial risk of flood plain occupants and to increase public
20 awareness of the flood hazard. Following the flooding in the
21 Northeast and Midwest in 1972, and the passage of the Flood
22 Disaster Protection Act of 1973, a tremendous increase in the
23 number of municipalities participating in the program has oc-
24 curred. With the Flood Disaster Protection Act the amount

1 of insurance coverage available was increased and the incen-
2 tives for municipalities to participate in the program were
3 strengthened. The National Flood Insurance Program has be-
4 come a significant tool in flood plain management due to the
5 requirement that municipalities adopt and enforce certain
6 land use controls.

7 The second development was the passage of the Water Re-
8 sources Development Act in early 1974. This legislation con-
9 sisted primarily of the authorization of expenditures for var-
10 ious water resource projects. Three nonstructural flood pro-
11 tection measures were authorized. One of the most important
12 provisions in the Act is Section 73 which directs that in the
13 survey, planning, or design by any Federal agency of any pro-
14 ject involving flood protection, consideration shall be given
15 to nonstructural alternatives to prevent or reduce flood dam-
16 ages. The cost sharing mechanism is the same as that for
17 structural projects with the exception that in no event shall
18 the non-Federal share exceed 20 percent of the project costs.
19 This requirement should considerably broaden the solutions
20 available to local and regional flooding problems.

21 The Federal government now has provided a complement of
22 measures which can be used to reduce flood damage to exist-
23 ing and future development. State and local governments are
24 beginning to recognize their crucial position in the develop-
25 ment of a total program of flood damage reduction. New York
26 State within the last year has implemented a statewide pro-
27 gram to assist municipalities in adopting and enforcing land

use controls required for participation in the National Flood Insurance Program. A sound basinwide program will involve a variety of measures, such as reservoirs, flood proofing, land use controls, flood warning systems, etc. The choices to be made in flood plain management and protection will hopefully reflect improved public understanding of flooding and its interaction with man's activities, and the expanded capability of individuals and responsible public agencies to reduce flood damages.

Section A - Needs Determination

For the first Water Resources Program, the presentation of the needs throughout the Basin for flood plain management and protection is a descriptive account, in general terms, of the kinds of activities which are necessary to develop a comprehensive flood damage reduction program. The quantitative basis for needs determination is basinwide and very general.

The determination of the broad categories of needs basically resulted from a general assessment of the flood risk and the overall capability to deal with flooding throughout the Basin.

The most recent estimates of flooding damage for the entire Basin are included in the Susquehanna River Basin Study completed in June 1970 by the Susquehanna River Basin Coordi-

nating Committee. Though the conditions and price levels have changed since then, the average annual flood damage figure at that time of $22.5 million remains a significant indicator of the magnitude of the flooding problem. There is little doubt that the situation within the Basin, with respect to the sizeable population exposed to flood hazards and the annual flood damage costs, merits a most serious and careful investigation of alternative solutions and the implementation of a comprehensive flood damage reduction program.

The following program needs have been identified:

1. Mapping (including inventory) of the Basin's rivers, streams and creeks in sufficient detail to adequately delineate the 100-year flood plain for future management purposes.

2. Determination of the optimum basinwide mix of structural and nonstructural flood damage reduction measures.

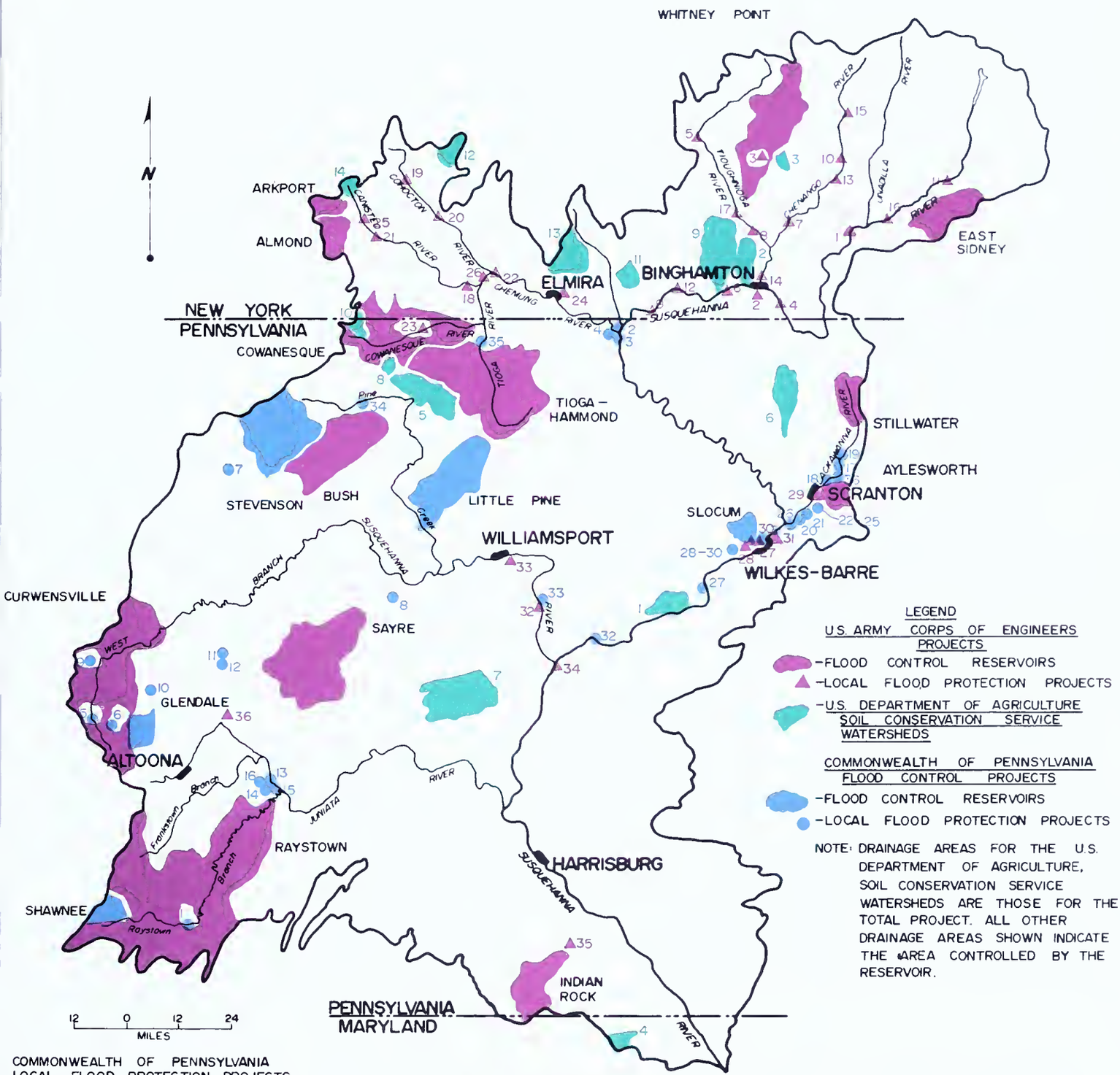
3. The development and extensive and effective use of flood plain regulations as a tool to guide future development away from flood-prone lands.

4. Expansion and improvement of the flood forecasting and warning system throughout the Basin.

5. Development and implementation of emergency measures designed to reduce loss of life and property in the event of a flood.

Section B - Existing Programs

This section describes and summarizes ongoing programs and projects of Federal, State and regional governments, and the SRBC. Information on current structural and nonstructural flood reduction measures and studies by the U.S. Army Corps of Engineers, Soil Conservation Service, Pennsylvania DER and New York DEC is provided in Figure 3 and Appendix A. Tables 1 and 2 summarize this information by sub-basin. Figure 4 and Table 3 show sub-basin delineations. Tables 5 and 6 present summaries on disaster renewal expenditures and flood insurance eligibility in the basin, respectively. Additional activities are described in Appendix B and a list of completed projects and reports is presented in Appendix C.



COMMONWEALTH OF PENNSYLVANIA
LOCAL FLOOD PROTECTION PROJECTS

1. EVERETT
2. ATHENS
3. SAYRE
4. SAYRE
5. BARNESBORO
6. PATTON
7. EMPORIUM
8. MILESBURG
9. CHERRY TREE
10. IRVONA
11. PHILIPSBURG
12. PHILIPSBURG
13. HUNTINGDON
14. SMITHFIELD
15. HUNTINGDON
16. SMITHFIELD
17. MAYFIELD, OLYPHANT, BLAKELY, THROOP, AND DICKSON CITY
18. DICKSON CITY
19. MAYFIELD
20. MOOSIC
21. MOOSIC
22-25 SCRANTON
26. DURYEA
27. MOCANAQUA
28-30 PLYMOUTH
31. WYOMING
32. DANVILLE
33. MILTON
34. GALETON
35. TIOGA
36. BLAKELY

U.S. ARMY CORPS OF ENGINEERS
LOCAL FLOOD PROTECTION PROJECTS

1. BAINBRIDGE, N.Y.
2. BINGHAMTON, N.Y.
3. CINCINNATUS, N.Y.
4. CONKLIN-KIRKWOOD, N.Y.
5. CORTLAND, N.Y.
6. ENDICOTT, JOHNSON CITY, VESTAL, N.Y.
7. GREENE, N.Y.
8. LISLE, N.Y.
9. NICHOLS, N.Y.
10. NORWICH, N.Y.
11. ONEONTA, N.Y.
12. OWEGO, N.Y.
13. OXFORD, N.Y.
14. PORT DICKINSON, N.Y.
15. SHERBURNE, N.Y.
16. UNADILLA, N.Y.
17. WHITNEY POINT VILLAGE, N.Y.
18. ADDISON, N.Y.
19. AVOCA, N.Y.
20. BATH, N.Y.
21. CANISTEO, N.Y.
22. CORNING, N.Y.
23. ELKLAND, PA.
24. ELMIRA, N.Y.
25. HORNELL, N.Y.
26. PAINTED POST, N.Y.
27. KINGSTON-EDWARDSVILLE, PA
28. PLYMOUTH, PA.
29. SCRANTON, PA.
30. SWOYERSVILLE-FORTY FORT, PA.
31. WILKES-BARRE, HANOVER TWP., PA.
32. MILTON, PA.
33. WILLIAMSPORT, PA.
34. SUNBURY, PA.
35. YORK, PA.
36. TYRONE, PA.

U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION WATERSHEDS

1. BRIAR CREEK, PA.
2. LITTLE CHOCONUT, FINCH HOLLOW, TROUT BROOK, N.Y.
3. GENEGANTSLET CREEK, N.Y.
4. LITTLE DEER, MD.
5. MARSH CREEK, PA.
6. MARTINS CREEK, PA
7. MIDDLE CREEK, PA.
8. MILL CREEK, PA.
9. NANTICOKE CREEK, N.Y.
10. NORTH FORK COWANESQUE RIVER, PA.-N.Y.
11. PATTERSON, BRIXIUS, GREY CREEK, N.Y.
12. UPPER FIVE MILE CREEK, N.Y.
13. NEWTOWN-HOFFMAN CREEK, N.Y.
14. MARSH DITCH, N.Y.

THE SUSQUEHANNA RIVER BASIN COMMISSION

UNITED STATES · NEW YORK · PENNSYLVANIA · MARYLAND

EXISTING AND UNDERWAY FLOOD CONTROL PROJECTS

Figure 3

Table 1

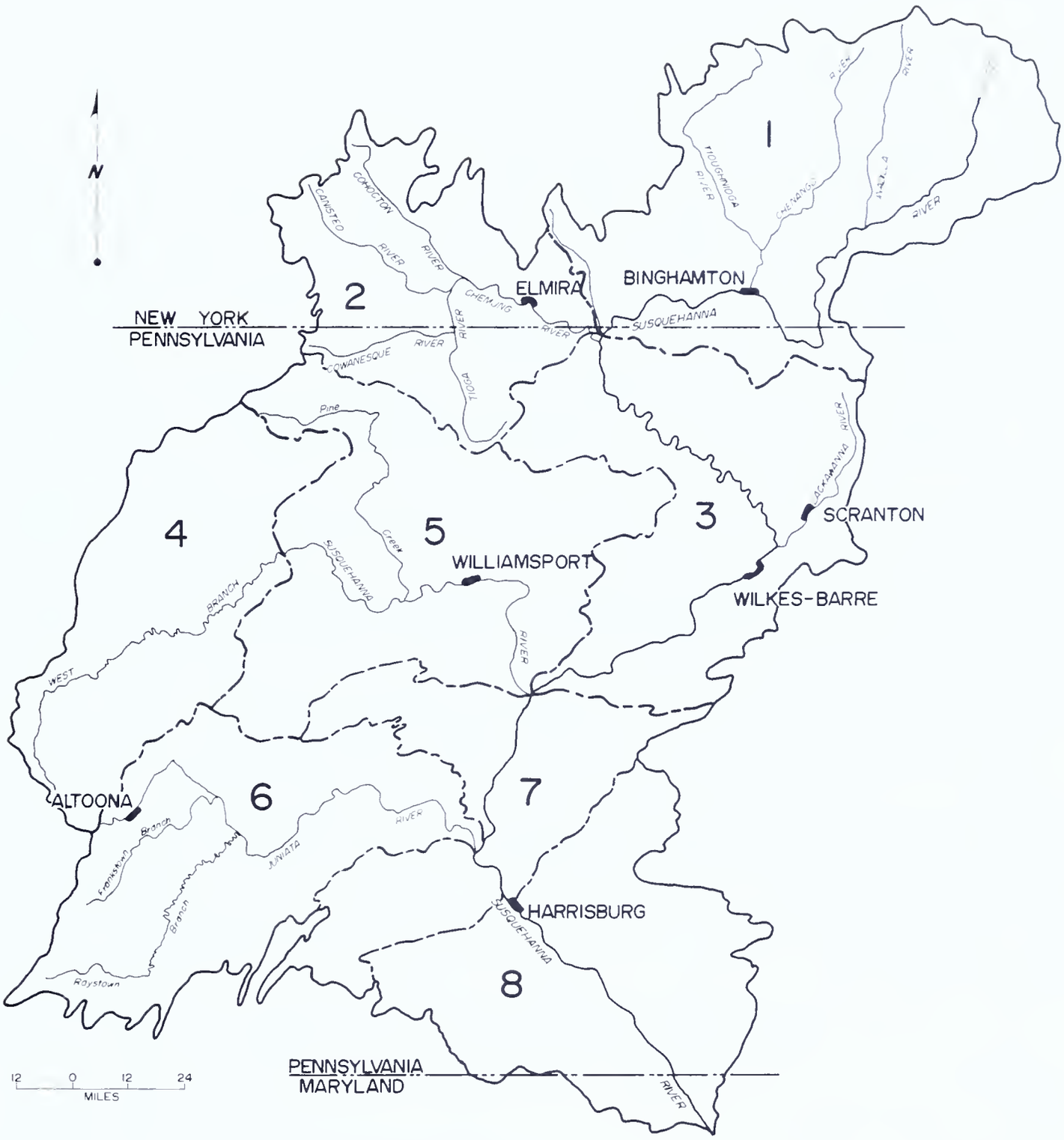
STRUCTURAL FLOOD CONTROL MEASURES

	SUB-BASINS								
	1	2	3	4	5	6	7	8	Total
Dams									
Existing	5	9	5	4	2	2	1	1	29
(Drainage Area Controlled in Square Miles)	(497)	(195)	(99)	(876)	(504)	(998)	(17.6)	(94)	(3,280.6)
Under Study	5	1	0	0	0	0	0	0	6
(Drainage Area Controlled)	(453)	0	0	0	0	0	0	0	(453+)
Under Construction	20	10	3	0	0	0	0	0	33
(Drainage Area Controlled)	(145)	(808)	(95)	0	0	0	0	0	(1,048)
Levees and Walls									
Existing	8	13	8	3	2	2	1	1	38
Under Study	1	6	13	4	3	3	1	1	32
Under Construction	0	0	0	0	0	3	0	0	3
Channel Improvement									
Existing	12	11	13	5	4	1	0	1	47
Under Study	1	1	14	2	5	2	0	4	29
Under Construction	0	1	1	0	0	1	1	0	4

Table 2

FLOOD PLAIN DELINEATION STUDIES

	SUB-BASINS								
	1	2	3	4	5	6	7	8	Total
Flood Plain Information Reports - Corps of Engineers									
Complete	3	0	3	0	5	2	0	0	13
Underway	3	0	3	0	0	2	0	0	8
Planned	14	8	3	0	3	3	0	0	31
Flood Insurance Studies HUD-FIA									
Complete	11	23	18	0	28	9	11	32	132
Underway	0	44	18	0	18	5	14	15	114
Proposed	1	11	24	0	35	15	4	84	174



THE SUSQUEHANNA RIVER BASIN COMMISSION

UNITED STATES·NEW YORK·PENNSYLVANIA·MARYLAND

HYDROLOGIC SUBBASINS

Figure 4

Table 3

AREAS OF HYDROLOGIC SUB-BASINS

SUB-BASIN	DRAINAGE	AREA (Sq.Mi.)
1	Susquehanna River, Upstream from Athens, Pennsylvania	4,944
2	Chemung River	2,604
3	Susquehanna River, Sayre, Pennsylvania to Sunbury, Pennsylvania	3,755
4	West Branch Susquehanna River, source to Renovo, Pennsylvania	2,975
5	West Branch Susquehanna River, Renovo, Pennsylvania, to mouth	4,017
6	Juniata River	3,406
7	Susquehanna River, Sunbury, Pennsylvania, to Harrisburg, Pennsylvania, (Excluding Juniata River)	2,399
8	Susquehanna River, Harrisburg, Pennsylvania, to mouth	3,410
	TOTAL SUSQUEHANNA RIVER BASIN	27,510

Table 4

DISASTER RENEWAL EXPENDITURES

	Municipalities	Expenditures	Percent of Federal Expenditure	State Expenditures	Percent of Total State Expenditure
New York	6	$ 77,700,000	97.2	$ 19,642,815	97.7
Pennsylvania	52	322,023,460	83.8	108,229,326	87
		$399,723,460	86	$127,872,141	88

Table 5

FLOOD INSURANCE ELIGIBILITY
AND
STUDY STATUS BY STATE

	Flood Prone	Eligible		Final Studies		Remaining To Be Studied (Percent)
		Number	Percent	Complete	Underway	
New York	204	54	26	24	14	86
Pennsylvania	974	472	48	99	98	80
Maryland	7	7	100	3	0	57
	1,185	533	45	126	112	79

Section C - Assessment

This assessment describes the relative effectiveness of agencies' present activity in meeting the flood plain management and protection needs identified in Section A. It is based upon consideration of agency programs presented in the preceding section and other information currently available to the Commission. It is guided by the Commission's objective to prevent loss of life and significantly reduce future damages through an integrated system of structural flood control and nonstructural flood plain management measures.

The magnitude of the flooding problem within the Basin demands a comprehensive solution. Over 90 percent of the basin's municipalities are floodprone. Major urban areas - Binghamton, Elmira, Corning, Wilkes-Barre--Scranton, Williamsport, and Harrisburg and many smaller cities and boroughs are subject to serious flooding.

In devising a comprehensive plan to reduce flood damages the limitations and opportunities of the different kinds of flood plains must be identified and considered. Rarely can extensive urban development on flood plains be feasibly or practically relocated. Structural measures provide the most common means of protection to these areas. Flood warnings and emergency measures to evacuate people and property are also very effective in minimizing damage to existing develop-

ment. Urban redevelopment or renewal programs can utilize nonstructural measures in the removal of existing structures and floodproofing of new and remaining structures.

There are significant flood plain areas in the Basin which are lightly developed, developing, or undeveloped. Local flood protection may not be economically feasible for sparsely populated or agriculturally developed flood plains. Nonstructural measures, particularly land-use controls, can provide the best opportunity for flood damage reduction for these areas, and can minimize future damage by limiting flood plain development.

The assessment addresses the progress that is being made in the development of these different but complementary elements which are essential to a comprehensive flood plain management and protection plan.

1. Need - Mapping

Approximately 1,185 municipalities in the Basin are flood-prone. Of these, 533 (45 percent) are currently participating in the National Flood Insurance Program. Flood insurance studies are completed or underway for 258 (48 per cent) of the participating municipalities. There remain 927 (78 per cent) of the Basin's flood-prone municipalities which will require studies.

SRBC is conducting most of these studies for HUD-FIA. With the current staff and at the current completion rate, it will take approximately 10-12 years to accomplish the Basin's mapping program.

The full impact of detailed flood plain mapping (in addition to its purposes in the Flood Insurance Program) on the behavior of individual property owners, developers, public utilities and planning commissions has yet to be seen. Opportunities to maximize the utility of this information will expand as the maps become widely available.

2. Need - Optimum Basinwide Mix of Structural and Nonstructural Measures

The existing reservoir system (including SCS P.L. 566 projects) controls approximately 11 percent of the Basin's drainage area. Reservoirs are under construction which will provide control of an additional three percent.

In its Flood Control Review Study the Corps of Engineers is conducting a systems analysis of existing and potential reservoirs. This will obviously produce a more detailed and thorough evaluation of the Basin's existing protection than is possible here.

Appendices D and E present information indicating the value of existing structures in reducing flood stages and the remaining need for flood plain management and protection. Appendix D presents data on the effect of the existing reservoir system in reducing the Flood of Record (prior to Agnes) at several locations in the Basin. Appendix E presents similar data on the reduction effect of the reservoirs during Agnes. Together these tables indicate (1) the amount by which the reservoirs reduced the natural flood stage of the particular flood event and (2) the amount by which the reduced or modified stage was greater or less than the established National Weather Service flood stage. (the term "natural" flood stage refers to the observed or extrapolated values of flood stages discounting the mitigating effects of reservoirs.)

Both appendices demonstrate that the reservoirs were successful in reducing natural flood stages by various amounts at the different locations. Despite the reduction effect of the reservoirs, the resultant stages were considerably in excess of N.W.S. flood stage values in many cases.

In terms of local flood protection within the Basin, there are approximately 39 existing levee and/or

1 floodwall projects and 58 channel improvement pro-
2 jects. Seven local projects - three levees and/or
3 walls and four channel improvements - are under con-
4 struction. Over 60 measures are in the study, planning
5 or design stage. In general there is a greater need
6 for both structural and nonstructural flood protection
7 to supplement that now afforded by existing structural
8 systems and current environmental management practices.

9 The value of nonstructural measures in reducing flood
10 damages cannot adequately be assessed at this point,
11 due particularly to the relatively recent adoption
12 of flood plain regulations by municipalities and to
13 the traditional emphasis on structural flood protec-
14 tion. Due to the limited use of nonstructural alter-
15 natives such as land-use controls, relocation, flood-
16 proofing, and easements, insufficinet information is
17 available on their applicability and effectiveness.
18 Implementation of Section 73 of the Water Resources
19 Development Act should eventually provide a basis for
20 a valid assessment of these measures.

21 Current planning activity could benefit from closer
22 coordination. This is particularly important in light
23 of the two broad-based study efforts - the Corps of
24 Engineers' Flood Control Review Study and DER's State
25 Water Plan. The Corps' Review Study is the most sig-

nificant activity relating to the adequacy of, and need for, structural measures. It will also attempt to develop nonstructural strategies for the Basin based on a pilot study in Binghamton. The study should be completed by the end of fiscal year 1977. Pennsylvania's State Water Plan will identify specific flooding problems and suggest alternative solutions. The Chemung and Eastern Susquehanna Boards' Plans present both specific and general flood plain management and protection recommendations.

In view of the significant areas and populations which continue to be exposed to serious flood damage, SRBC should coordinate these studies and other Federal and State agencies' activities to maximize the value of the information, expertise and time being expended. Specific mechanisms and responsibility should be established for implementation of selected solutions through interagency coordination.

3. Need - Flood Plain Regulations

Minimum flood plain regulations are being adopted by municipalities in response to the requirements of the National Flood Insurance Program. Less than half of the Basin's floodprone municipalities are currently participating in the program. This limits the number of municipalities which, to maintain the avail-

ability of insurance to private citizens, are required to enforce flood plain regulations.

The requirements of the Flood Insurance Program present difficulties for many municipalities. There is a wide variety among local governments in terms of staff, technical expertise, funding and previous experience with land-use controls. Variations exist among the three signatory States as well. These differences result in inconsistent and possibly conflicting management efforts.

The need of municipalities for technical, legal and financial assistance exceeds the capacity of existing State, regional and county assistance efforts.

Enforcement of flood plain regulations will determine their value in reducing flood damage potential. More time and experience is required before a proper assessment can be made of the effectiveness of enforcement efforts.

4. Need - Flood Forecasting and Warning System

The National Weather Service is upgrading and expanding the forecasting and warning system along the main stem of the Susquehanna and its major tributaries. Gaging stations which were destroyed during Agnes or

which are obsolete are being replaced; new, improved gaging stations are being added. This will expand the capability for data collection. The communication network essential to warning dissemination is also being improved. The operational capability of the GOES Data Collection System within the Basin will be considerably advanced over the next several years with the planned installation of 21 data collection platforms.

Certain aspects of the forecasting and warning system remain inadequate. Residents of the Basin who live along smaller tributaries or in watersheds subject to flash flooding do not receive adequate coverage under the existing system. It is clear that the responsibility for providing warning in such circumstances lies with both the Weather Service, in providing technical and planning assistance in designing warning systems suitable to the characteristics of the smaller watersheds, and the local population in maintaining a continuous commitment to a local forecasting and warning system.

5. Need - Emergency Measures

A review of disaster preparedness plans of the Federal,

State, county and municipal governments has not been attempted. While such an acitivity would be worthwhile, the task is quite complex, requiring review of all established plans and more importantly review of actual or simulated disaster operations. At the present time, the three signatory States are in the process of revising their disaster assistance and emergency operations plans.

While the statutory framework necessary for developing and conducting emergency disaster operations exists at the various governmental levels, there appears to be wide differences in the manner and degree to which operational plans are devised and implemented. In general, maximum effectiveness of emergency planning and preparedness activity appears to have been limited in the past by a number of factors; indefinite assignment of responsibility for carrying out various emergency tasks; inadequate level of coordination and communication among local groups and the different levels of government; few instances of periodic testing of procedures and communication networks; and lack of regular training programs for local officials and volunteers. This comment summarizes some of the more difficult and

obvious obstacles which exist basinwide and does not apply to every civil defense or disaster-related organization.

The operation of both the forecasting and warning system and emergency preparedness programs would benefit from expanded communication with the public through regular education and training programs, seminars, information packages, greater use of radio, television, newspapers, etc.

Section D - Recommended Programs

The general and specific recommendations present changes in existing programs and suggestions for new programs. The list of recommendations is not, at the present time, complete or detailed. It is meant to give direction and support to the flood plain management and protection activity of Federal, State and local agencies, and the Commission.

1. Need - Mapping

Susquehanna River Basin Commission

a) Accelerate the mapping and hydrologic activity being conducted for the National Flood Insurance Program by expanding staff capability.

b) Inventory flood plain development throughout the Basin.

OTHER AGENCIES

Corps of Engineers

a) Expand the number of flood insurance studies being conducted for HUD-FIA and/or modify the scope and methodology of the Flood Plain Information Reports to satisfy HUD-FIA insurance study guidelines.

2. Need - Optimum Basinwide Program of Structural and Nonstructural Measures

Susquehanna River Basin Commission

a) Prepare detailed flood plain reports by sub-basin, indicating the extent of flood plain land area, the population and structures occupying the flood plain, and existing and planned flood damage reduction measures. Localities and alternative flood damage reduction measures will be identified for priority study and action.

b) Coordinate planning and implementing of structural and nonstructural measures of other agencies as part of a comprehensive flood damage reduction program.

c) Increase staff expertise in structural and nonstructural measures analysis in order to establish SRBC criteria for evaluating proposed basinwide programs.

d) Assist the States and Federal agencies in the identification of areas to be considered for nonstructural flood damage reduction planning under the provisions of Section 73 of the 1974 Water Resources Development Act.

OTHER AGENCIES

Corps of Engineers and Soil Conservation Service

a) Continue to plan all flood-related programs in close consultation with the signatory States and and Commission.

States

a) States should continue to coordinate with the Corps of Engineers in its ongoing Flood Control Review Study to develop a phased flood damage reduction plan.

3. Need - Flood Plain Regulations

Susquehanna River Basin Commission

a) Achieve consistency in objectives and methods used throughout the Basin by establishing guidelines for flood plain regulations and coordination of Federal, State and local regulatory activities.

b) Determine and implement the best mechanism for improved interagency coordination and communication.

OTHER AGENCIES

States

a) The Pennsylvania and Maryland State legislatures should adopt statewide flood plain management legislation which would generally establish adequate levels of State staff and funding to provide technical and legal assistance to municipalities in developing and implementing flood plain regulations.

Local

a) Upon notification by HUD-FIA, municipalities should proceed as quickly as possible to qualify for flood insurance by adopting the required land-use controls.

4. Need - Flood Forecasting and Warning System

Susquehanna River Basin Commission

a) Expand and improve(with the National Weather Service and U.S. Geological Survey)the existing system, specifically in the communication network.

b) Continue financial support for the expansion of the GOES Data Collection System.

c) Assist in the implementation of self-help forecasting and warning programs in the Swatara Creek Watershed in Pennsylvania, in Steuben and Chenango Counties in New York, and other watersheds which indicate both the need for and interest in such a program.

OTHER AGENCIES

U.S. Geological Survey

a) Continue to expand and improve its system of river and rain gaging stations.

National Weather Service

a) Continue to improve its warning communications system.

States

a) Continue cooperative programs with USGS to expand and maintain the river and rain gaging stations.

5. Need - Emergency Measures

Susquehanna River Basin Commission

a) Prepare a mobilization plan for its own staff and resources in the event of an emergency flood situation.

OTHER AGENCIES

National Weather Service

a) Improve the reliability and effectiveness of flood warning dissemination networks by coordinating with civil defense organizations, law enforcement personnel, and other local groups and individuals.

States and Local

a) State, county and local civil defense organizations should continue efforts to maintain and improve the operational capability of emergency preparedness programs. State and local emergency plans should include explicit delineation of responsibility and require regular emergency simulation testing of procedures and personnel training programs.

b) Municipalities within the Basin which have not yet established an emergency or civil defense organization should establish such an organization or consider the possibility of joining with neighboring municipalities and pooling resources to provide a more effective area-wide emergency program.

c) States should continue to assist local communities in instituting local flood warning subsystems.

CHAPTER THREE: WATER SUPPLY

The assurance of adequate water supplies for domestic, municipal, industrial and agricultural use has traditionally been the responsibility of local agencies. While local planning has generally been successful in providing abundant supplies with minimal conflict with other municipalities' water supply sources, that picture is rapidly changing. Increasing opposition to dams and reservoirs, rising construction costs, and greater awareness of environmental consequences have contributed to a more complex planning context. In effect, the ability of public authorities or private companies to plan and construct needed facilities has been declining as the factors favoring regionalization have increased. Water supply planning can no longer be carried out on a merely municipal basis without examination of broader impacts and economies of scale. Coordination of water supply planning is an essential activity in the development of water supplies to serve the increasing needs of the Basin's population. It is equally important that additional data and analyses of surface and groundwater sources be provided. Information on critical factors of surface and ground water sources - the quantity and quality, the sustained yield, the flow relationship between the two sources, the consequences of utilization of different sources - can assist the development of optimum management plans.

The primary purpose in the presentation on water supply in this year's program is to raise the complex supply issues and needs before water resource agencies and the public. A greater awareness of the urgency and the interrelated nature of water supply planning is imperative to stimulate proper management and protection of the Basin's water supplies. While the water supply discussion is not exhaustive, it does attempt to provide meaningful direction for potential planning activities.

Section A - Needs Determination

The identification of water supply needs recognizes the existence of two basic conditions: (1) the insufficiency of data on both the availability and the demand for water; and (2) the relatively poor understanding of the basinwide effects of increasing water use and consumption. The needs generally evolved from the view that this situation has hindered the flexibility of managing and protecting water supply resources, and as such identifies particular activities which would contribute to the overall improvement of water supply planning throughout the Basin.

The following program needs have been identified:

1. Determine the availability of surface and ground water resources within the Basin.
   a) Compilation of existing data

b) Collection of additional data on:

(1) Ground water availability; quantity and quality; recharge capability; geologic factors.

(2) Hydrometeorologic factors affecting droughts: e.g., evapotranspiration.

c) Data analysis:

(1) Characteristics of low stream flow.

(2) Drought conditions: causes, frequency and duration of occurrence; hydrometeorologic factors during low flow periods.

d) Investigation of interrelated nature of surface and ground waters.

2. Forecast water demands for domestic, industrial, agricultural, recreation and power generation purposes.

a) Determine present water use from both public and private water supplies.

b) Identify factors which will influence future water demands.

c) Forecast future demands based on alternative assumptions of factors affecting water use.

3. Synthesis of water supply and water demand data into a basinwide water availability model.

a) Identify for priority action areas with urgent short-range water supply needs.

b) Evaluate effects of proposed projects on availability of water (including population growth, industrial development and land-use changes).

4. Identify measures to improve management and protection of surface and ground water sources.

a) Development of criteria or standards for land uses which impact on water resources.

b) Examine existing water management institutions - legal, political, and economic - and recommend changes to improve resource allocation and use.

c) Coordinate water and land resources planning.

5. Development of a plan for the management of water shortage emergencies.

a) Develop methodology and criteria for predicting and managing water shortage emergencies.

b) Investigate alternative means and water supply sources.

c) Develop mechanisms for implementation of plans.

Section B - Existing Programs

This section identifies major planning activities currently underway by Federal, State and regional government agen-

cies and the private sector. While information is not provided, for the most part, on continuous and supportive programs, (such as data collection and storage systems, and annual data reports), nor on water supply planning efforts of individual water supply companies or municipal authorities, this is not intended to minimize their importance or role. Rather, by concentrating on the major activities, this section will aid in providing a clearer perspective on both the opportunities and obstacles in cooperative multi-purpose management of the Basin's water supplies. Major water supply development plans are presented in Table 6* along with an indication of how the plans relate to the previously identified program needs.

Federal Agencies

U.S. ARMY CORPS OF ENGINEERS (NORTH ATLANTIC DIVISION)

1. Northeastern United States Water Supply Study

   a) The development of water supply alternatives for southcentral Pennsylvania currently under review, (see Table 7), was based on projections of water demand through the year 2020 for the urban metropolitan areas of Harrisburg, York, Lancaster and Lebanon. The Corps utilized Pennsylvania DER data on future public water supply demand and developed a separate method-

* See Page 69

ology for estimating total industrial water demands. This method incorporates economic parameters of a geographic area and technological improvements in industrial water using processes.

b) Future water demands were similarly estimated in the NEWS Preliminary Study of Long-Range Water Supply Problems of Selected Urban Metropolitan Areas (November 1973). Five areas in the Basin were included in this study: Binghamton, Elmira, Scranton-Wilkes-Barre; Williamsport and Altoona.

2. National Assessment

The Corps of Engineers-North Atlantic Division is assisting the Water Resources Council with collection of information for the Second National Assessment of Water Resources. Work sheets were submitted by the Corps to State and Federal agencies and the SRBC for the purposes of determining the extent of water supply and related water and land resource problems.

U.S. GEOLOGICAL SURVEY

1. USGS is the principal agency with programs throughout the Basin for collection, storage and analysis of data pertaining to water availability. In cooperation with the States, USGS operates and maintains surface and groundwater gages and observation stations, through which data on water quantity and quality are obtained.

2. USGS has underway a program in which county groundwater resources reports will be developed and published. Several county reports are presently in progress in Pennsylvania and Maryland. These reports summarize general hydrologic and geologic information, including a description of the present use and potential value of aquifers.

3. Additionally, selected regions such as metropolitan area or a particularly unique or valuable resource area may be the subject of more extensive study. Of note within the Basin are studies on (1) urban and rural groundwater hydrology in the northern part of Cumberland County and (2) the groundwater hydrology of the Williamsport metropolitan area.

4. In cooperation with SRBC, USGS has recently completed a low-flow regionalization study for the Basin in which regional relations of low stream flow characteristics were developed. The specific characteristics examined were the 1-, 7-, 30-, and 183-day low flows for the annual series and the 1-, 7-, and 30-day low flows for the critical months (May-October) series.

5. The following reports which pertain to the New York portion of the Basin are near completion:

a) Stream flow in the Susquehanna River Basin, New York - provides information on flow duration and low flow frequency, flood magnitude and frequency, sand and gravel water storage factors and stream flow quality.

b) Clinton Street - Ball Park aquifer in Binghamton and Johnson City - description and elevation of aquifer potential with recommendations for improved management.

c) Infiltration from tributary streams.

6. The following reports also pertain to the New York portion of the Basin and are in progress:

a) Stratified drift aquifers in the Susquehanna Basin, New York - map and description of aquifers, with methods of estimating aquifer yield.

b) The bedrock aquifer in the Susquehanna Basin, New York - collection and analysis of data on geology, water quality, well yields, and an elevation of the potential for supplying suburban housing development.

c) Induced infiltration from streams - case histories and analyses of pumpage, water levels and water temperatures near five well fields that induce substantial recharge from major streams.

SOIL CONSERVATION SERVICE

1. Through its formal program activity associated with P.L. 566 small watershed projects and RC&D projects and, generally, technical assistance to farmers and other land owners, SCS provides both guidance and specific project measures designed to control harmful practices and improve land and water resource conditions. The wide range of SCS activities both directly and indirectly benefits the protection of surface and ground water resources.

Interstate Agencies

SUSQUEHANNA RIVER BASIN COMMISSION

1. SRBC has funded the previously described USGS low flow regionalization study. As a second phase of this study, SRBC and USGS will apply the low flow data to the prediction of the location and duration of water shortages, and the evaluation of potential water storage sites.

   SRBC is currently identifying several areas of investigation critical to water supply planning for possible study under a continuing cooperative

program with USGS. Among the studies being considered are: a) flow routing studies in the lower main stem and in the Juniata sub-basin, and b) a pilot study of stochastic flow modeling in the Juniata basin.

State Agencies

New York

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

1. Regional Water Resources Planning Boards

a) Chemung River Basin Comprehensive Plan. The plan contains projections of future water demand based on two sets of assumptions of population and economic activity trends. The base level demand projections were based on 1972 New York State Office of Planning Services Demographic Projections. The regional development projections assume a strengthening of the Chemung Basin's economy, bringing about a reversal in migration trends. Future demands for water uses were estimated using projections of future population and a projected unit water use Privately supplied industrial water demands were based on data on present industrial water use,

present and future manufacturing employment and changes in technology. The plan includes recommendations for improved land and water management and detailed investigations of the basin's ground water resources.

b) Eastern Susquehanna River Basin Comprehensive Plan. The Eastern Susquehanna Plan's base and regional development levels were based on assumptions of population and economic growth similar to the Chemung Plan. Water demands were derived from county water supply studies, up-dated through the use of New York State Office of Planning Services March 1974 population projections. The plan sets forth specific recommendations for detailed ground water investigations and watershed management.

<u>Pennsylvania</u>

DEPARTMENT OF ENVIRONMENTAL RESOURCES

1. State Water Plan

a) DER has developed specific objectives for guiding the water supply planning effort. The basic goal is the provision of water supplies of adequate quantity and quality to meet short-range and long-range needs. The objectives are listed in Table 7.

b) DER is not yet at the stage of formulating alternative water supply plans or solution concepts. Basic to that stage, however, is an analysis of water supply and demand. In analyzing developed and potential water supply resources DER will determine (1) water availability of existing sources of water supply, (2) low flow requirements and (3) ground water availability by geologic units. The estimates of future water demands will be used in analysis of the adequacy of existing and planned water supply facilities in order to identify urgent and long-range problem areas. DER has established methodologies for the estimation of demand for the following categories of water use:

(1) Public water supply
(2) Self-supplied domestic
(3) Self-supplied industrial
(4) Electric power (cooling, self-supplied)
(5) Institutional (self-supplied)
(6) Agricultural (self-supplied)

DER is utilizing its municipal water use inventories (1970 and 1974) as input into a model to determine future public water supply demand.

Simply, the demand will be derived by allocating projected population growth to individual water companies' service areas and multiplying the population figures by projected units of water use (gpcd's). The other methodologies are described in "Planning Principles".

c) A separate document, "Pennsylvania Water Laws Institutional Arrangements", will investigate and analyze the legal and institutional constraints surrounding such issues as water allocation rights, water supply and distribution, water pollution, water obstructions, flood control and water resources planning and management. The report will recommend changes or modifications in the law, economic policy and water resources planning.

2. Groundwater Studies

A number of cooperative resource projects have been undertaken with USGS:

Groundwater Studies of the Greater Williamsport Area

Groundwater Studies of the Bloomsburg-Berwick Area

Groundwater Hydrology of the Northern Cumberland Valley

Hydrology of the Gettysburg Formation of Lebanon, Dauphin and York Counties

Groundwater Hydrology of Southern York County

Maryland

DEPARTMENT OF NATURAL RESOURCES

1. DNR is refining management policies for the State water appropriation permit system. A policy of maintaining low flows into Chesapeake Bay with compensation for consumptive use is applied. Standards for groundwater use are being developed for management purposes.

2. Under the State's permit procedure, groundwater users are required to submit semiannually to the Water Resources Administration monthly average, maximum and total use records. Surface water users will soon be required to submit similar data. The specific frequency and kind of data to be required will depend upon the size of appropriation and will be described in the permit.

3. DNR has evaluated local and regional water supply and demand projections to identify problem areas in the lower Susquehanna Basin. This information and the river basin water supply plans will together form a watershed management plan to be implemented by the appropriation permit program.

Private Organizations

SUSQUEHANNA RIVER BASIN ELECTRIC UTILITIES GROUP

1. The SRBC Electric Utilities Group has recently submitted its annual update of the Master Siting Study - Susquehanna River Basin. Estimates are provided in the report on the consumptive water requirements for each electric generating station planned or proposed for the next fifteen years (1975-1989) in the Basin. Graphically, the report indicates the total estimated cumulative consumptive water requirements for the generating plants proposed for construction in that time period. Information is also provided indicating the total existing and projected consumptive water use by the utilities.

Table 6

CURRENT WATER SUPPLY PLANS IN DEVELOPMENT

CORPS OF ENGINEERS (NAD)

Title of Plan	Relation to Water Supply Needs	Status	Objectives
Water Supply Development Alternatives for South-central Pennsylvania	Contributes to meeting needs 1(d), 2(c), and 4(b).	Draft Under Review	Determine engineering and economic feasibility of alternative water supply facilities development to satisfy urgent and long-range (2020) municipal domestic and industrial water demands. Provide legal, institutional and cost-sharing analyses necessary to implement recommended development alternatives. Evaluate sources of water required for water supply and determine whether and to what degree ground water development affects surface flows. Assessment of environmental social and economic impact of water supply development alternatives.

NEW YORK DEC (Chemung River Regional Water Resources Planning Board)

Chemung Basin Plan	Contributes to meeting needs 2 and 4.	Recently approved by DEC (anticipated).	Identify present and future needs and problems, and resource management and development potential. Formulate and analyze wide range of alternative strategies on basis economic feasibility, benefits and costs and environmental compatibility.

Table 6 (Cont'd)

NEW YORK DEC - (Continued)

Title of Plan	Relation to Water Supply Needs	Status	Objectives
			Selection of plan to serve as guid to protection, conservation, development and utilization of water and related resources.
NEW YORK DEC (Eastern Susquehanna River Basin Regional Water Resources Planning Board)			
Eastern Susquehanna Basin Plan	Same as Chemung Plan	Final Review	Same as Chemung Plan.
NEW YORK DEPARTMENT OF HEALTH			
Comprehensive Public Water Supplies Studies and Reports	Contributes to meeting needs 2 and 4(b).	County reports complete; final comprehensive report by Department of Health in preparation.	Preparation of a plan for each county for the development of projects to provide adequately for present and reasonably foreseeable area wide public water supply system needs. Information to include engineering feasibility, cost estimates and proposed methods of financing.
SOUTHERN TIER CENTRAL REGIONAL PLANNING AND DEVELOPMENT BOARD			
Regional Water and Sewer Plan	Contributes to meeting need 4(b).		Develop regional approach to water supply and sewage problems and opportunities for solution. Aid STC in evaluating applications for Federal funding under A-95 review process.

Table 6 (Cont'd)

PENNSYLVANIA DER

Title of Plan	Relation to Water Supply Needs	Status	Objectives
State Water Plan	Contributes to meeting needs 1(a), 1(b)(1), 1(c)(1), 2, 4(b) and 5(c).	Stage I Inventory and Problem identification to be completed by sub-basin during 1975.	Develop water resources to assure adequate supplies during water shortages, droughts and other possible emergencies. Identify feasible alternatives considering physical, social, economic and environmental factors. Encourage reuse of water, and the development and use of new technology. Stress conservation measures that help insure future availability of water resources. Suggest changes in water laws and institutional arrangements required to insure the adequacy and equitable distribution of present and future supplies.

Section C - Assessment

The assessment of current water supply planning activities is based upon the program objective and goals of the Comprehensive Plan and the needs identified in the Water Resources Program. The broad objective is "the fulfillment of immediate and projected long-range demands of the people of the Basin for domestic, municipal, agricultural and industrial water supply, including use for cooling and irrigation."

The present description and evaluation of activities, as noted before, represents only a partial picture of the range and value of the many activities occurring throughout the Basin. The discussion of water supply, therefore, does not constitute fulfillment of the Comprehensive Plan's Early Action recommendation that the SRBC evaluate on-going water supply planning and completed studies. The completion of this task is necessary as the SRBC begins to establish a definitive water supply program. It will also assist in the improvement of water supply management throughout the Basin, and will permit a more thorough and useful assessment of water supply planning in future Water Resources Programs.

With this constraint in mind, a general overview is presented, along with an assessment of how the on-going programs serve to meet the identified programs needs.

General Assessment

While water is a renewable resource, there are factors in its location and frequency of distribution and quality which

1 work to effectively limit the available supply. Many planning
2 efforts, while possibly at present correct in the assumption or
3 estimation of an abundant supply, do not recognize that water
4 is, in a sense, in limited supply. Water supply planning thus
5 becomes responsive primarily to population projections and is
6 simply a matter of satisfying all the demands. The drawbacks
7 of this approach are a lack of flexibility in solutions required
8 to meet the needs, under-or-over commitment of necessary funding
9 and misallocation of water and related resources. To insure more
10 efficient and equitable management of the water supply, planning
11 must broaden its objective and methodologies.

12 With increasing and conflicting demands for water within
13 the Basin and throughout the entire Northeast, understanding of
14 the long-range consequences is essential, yet noticeably deficient.
15 In particular, knowledge is lacking on the specific implications
16 for the Basin's hydrologic system, which may in turn have far-
17 reaching effects on the extent and form of urban development
18 and on the efforts to maintain and improve the Basin's natural
19 resources.

20 What are the cumulative effects of increasing water use -
21 in terms of the Basin's population, industry and agriculture,
22 and the fresh water needs of Chesapeake Bay? What effect does
23 water supply planning in the Eastern Susquehanna Sub-basin in
24 New York State have on the use of water in the Lower Susquehanna?

Water supply planning, for the most part local in scope of authority, has also been local in its consideration of effects on adjacent municipalities or surrounding watersheds. Awareness of broader regional interaction, while not characteristic of past planning, must increase. Pennsylvania's State Water Plan and the Chemung and Eastern Susquehanna Plans are significant attempts to provide a framework for relating local needs and facility planning to the hydrologic system and the water demands of an entire sub-basin. Fullest advantage must be taken of these efforts which also seek to integrate water supply planning with flood plain management and protection, water quality, recreation and overall environmental management.

Specific Assessment

1. Need - Water Availability: Data Collection and Analysis

Surface and groundwater data collected by USGS and the States is essential in water supply planning. Surface water data appears to be adequate in terms of Basin coverage. However, the current system of groundwater data collection is not sufficient in view of the availability and present and potential use of groundwater resources. Beyond an expansion of basic groundwater data collection, it is important that data be provided on specific aquifer

characteristics: anticipated yield, storage capacity, transmissivity, recharge capability, quality, etc.

In view of the significant economic, social and environmental consequences of water shortages, the understanding of the factors which cause and contribute to the occurrence of drought is far from satisfactory. Basic data on a variety of hydrometeorologic factors is lacking. Agencies involved with data collection should aggregate existing data and identify potential areas of research.

The capability of public agencies and private groups and individuals to successfully deal with particular resource problems requires more extensive use of the basic data both in the direct analyses of availability conditions and in the study of the relationship of such data to water quality, climatologic conditions, stream ecology, land use, etc. The analysis of basic data and its application to resource problems remains of fundamental importance. One critical area is in the utilization of basic data and analysis in the prediction of drought occurrences.

Improving the management of water resources depends on many factors - hydrologic, geologic, economic and legal.

In order to identify the opportunity for and constraints on the integrated use of surface and ground water supplies, more detailed hydrogeologic investigations on their physical interaction and consequences of utilization must be conducted.

2. Need - Present Water Use and Demand Forecasts

In evaluating the availability of data on present water use, it is found that differences exist between the States in the kind of data records maintained. While Pennsylvania allocates surface water, Maryland and New York require permits for both surface and ground waters. Pennsylvania does, however, maintain records on the quantity and quality of ground water through its well drilling licensing program.

While records on the permitted allocations are maintained, data on actual use is not abundant. Maryland is revising its surface and ground water permit systems to improve this situation. Also, more data on private water supplies and in particular industrial water use is needed to develop a more complete picture of basin-wide water supply and demand.

Several activities underway or recently completed incorporate estimates of future water demands. Though the estimates have not been thoroughly evaluated by SRBC, there is a concern that these figures should not be utilized as the only determinant in planning future facilities; projections of future water demands should not be necessarily considered as water "requirements." Since much planning relies on such projections, it would be worthwhile to investigate the implications of different demand methodologies and assumptions on water supply plans. An analysis of the various factors of demand would contribute to determining the validity and usefulness of demand projections. The projections by the SRBC Electric Utilities Group on future water use represent an increasingly large amount of consumptive loss. While the projections have been revised downward from last year's report due to changes in market circumstances, there remains the crucial task of evaluating the impact of increased utility construction (particularly cooling towers) on the water regime of the Basin, both in terms of consumptive loss and thermal pollution.

3. Need - Basinwide Water Availability Model

While present and future water supply plans and pro-

jects will place a continually increasing demand upon the Basin's water resources, little effort has been expended toward quantifying and understanding the cumulative effects of this withdrawal and use, in terms of basinwide hydrologic, ecological, economic and social impact.

The USGS low-flow regionalization study represents a significant initial step toward collecting the kind of data essential to developing an appropriate and rigorous hydrologic Basin model. The early and complete development of a model will require the collection and analysis of additional data, evaluation of the impacts of water use, and the selection of flow criteria.

4. Need - Management and Protection of Surface and Ground Water Sources

The three States are all moving on various fronts to more effectively protect and manage water resources. Within the next year, Pennsylvania will be identifying specific measures to improve resources management and conservation for each sub-basin. A broad range of alternatives, traditional and innovative, should be considered, and the consequences of implementing these measures should be thoroughly examined. The

report, "Pennsylvania Water Laws and Institutional Arrangements", should provide analyses of water rights and laws, and water resources planning which are valuable in resolving current and anticipated water resources issues and conflicts.

New York State, in the Chemung and Eastern Susquehanna Plans, recognizes the pressing need to protect valuable ground water resources. The plans include specific recommendations to (1) obtain more precise data on resource conditions; (2) examine government policies of cost-sharing; and (3) implement resource development and management projects.

Pennsylvania's State Water Plan and New York's sub-basin plans have as an explicit objective the co-ordination of water and land resources planning. The achievement of that objective will, in most instances, depend upon the cooperation of several agencies at the Federal, State and local level. The comprehensive scope of these endeavors, however, will facilitate the integration of multiple resources planning.

It is not possible to evaluate Maryland's ground water resource management plan, still in development, but the establishment of standards should aid in preventing over-utilization of ground water supplies.

5. Need - Water Shortage Emergency Management

While water supply planning, in general, considers the occurrence of low flow conditions, planning for drought conditions has been minimal. The planning for such circumstances has been influenced by (1) the lack of actual drought experience and (2) the lack of scientific data on and understanding of the frequency and duration of droughts. The USGS low-flow study (Phase I) will provide a more complete data base from which to develop detailed analyses and models of drought occurrence in the Basin.

Section D - Recommended Programs

1. Need - Water Availability: Data Collection and Analysis

Susquehanna River Basin Commission

a) Continue and expand the low-flow regionalization study with USGS.

b) Conduct studies of hydrometeorologic factors and other causes of drought conditions.

c) Identify, with USGS and the States, particular resource characteristics and geographic areas for detailed investigation.

d) Compile a data system on the basinwide availability of water.

OTHER AGENCIES

U.S. Geological Survey

a) Continue cooperation with the States and SRBC in determining areas of potential and expanded research. Of particular concern is the need for data and analyses on the physical interrelationship of surface and groundwater resources.

b) Expand basic groundwater data collection program.

States

a) Initiate, with USGS, specific investigations to acquire data on the availability and characteristics of water supply sources that have been determined to be valuable and/or in need of urgent protection.

2. Need - Present Water Use and Demand Forecasts

Susquehanna River Basin Commission

a) Collect data on present water use within the Basin in cooperation with the States and public and private water supply companies.

b) Investigate the factors affecting water demand to:

(1) Assess the validity of demand projections; and

(2) Facilitate the determination of alternative approaches to meeting water supply needs.

c) Develop demand forecasts to serve as a basis of evaluation of other agencies' projections and plans and to indicate potential problem areas.

d) Evaluate ongoing and completed water supply plans. This task should include a separate and complete analysis of the impacts of proposed electric generating facilities.

OTHER AGENCIES

States

a) Contribute to an investigation of water demand factors by SRBC to improve methodologies of forecasting future water use.

b) Analyze the implications of different sets of demand projections on proposed plans and sub-basin environments.

c) Collect basic data on water use through water allocation programs.

3. Need - Basinwide Water Availability Model

Susquehanna River Basin Commission

a) Develop, in cooperation with USGS, a model which assess the continuing ability of the Basin's hydrologic system to provide adequate quantities of good quality water by combining critical data and factors of water supply and demand.

4. Need - Management and Protection of Surface and Ground Water Sources

Susquehanna River Basin Commission

a) Coordinate, with the States, to prescribe regulations of land use designed to minimize adverse effects on water sources.

b) Continue and expand assistance in and coordination of major planning activities, particularly Pennsylvania's State Water Plan and the Chemung and Eastern Susquehanna Basins' Plans.

c) Investigate and determine the present institutional framework of water management. Address the question of SRBC authority as established by the Compact, specifically examining the issue of inter-basin transfers.

d) Promote the coordination of water and land resources planning through (1) review of projects; (2) continued consultation with appropriate agencies; and (3) sponsorship of workshops or seminars for public officials, planners, engineers, scientists and the public, to confront and discuss resource issues.

OTHER AGENCIES

Soil Conservation Service

a) Accelerate planning and implementation of P.L. 566 and RC&D projects as required.

States

a) Develop criteria for the protection of aquifer recharge areas.

b) Carryout investigations necessary for the integration of surface and groundwater management.

c) Maryland and New York should initiate a review of their existing water (and related resources) laws and institutions to identify potential approaches to improving water resources management.

5. Need - Water Shortage Emergency Measures

Susquehanna River Basin Commission

a) Develop a model for predicting water shortage emergencies utilizing data and analysis

provided in the USGS low-flow study.

b) Develop guidelines for water management during drought conditions.

c) Assist the States and local agencies in the identification of potential water sources and action plans for emergency conditions.

OTHER AGENCIES

States

a) Review existing emergency supplies and plans to determine their adequacy in the event of water shortage and, if necessary, develop additional sources and management alternatives.

Local

a) Municipal authorities and water supply companies should evaluate the adequacy of existing sources under different drought conditions, and identify the necessary steps to improve their capability of meeting demands.

CHAPTER FOUR: WATER QUALITY

The deleterious effects of water pollution on public health, aquatic ecosystems and many water derived benefits are well known. The emphasis on water quality management has grown with the magnitude and diversity of the pollution problems.

The primary tools for appropriate management programs have been in the form of State and Federal legislation. The scope of agency programs in water management has grown from purely public health concerns to address other implications of water degradation.

New York, Pennsylvania and Maryland have all established interstate and intrastate water quality standards which are revised periodically. The States have many on-going programs aimed at abating water pollution in the Susquehanna River Basin.

In New York, the Pure Waters Act of 1965 and the Environmental Bond Act of 1972 provided the authority to fund additional sewage treatment facilities. The 1972 revisions to the New York Conservation Law - Article 17 state their purpose to be the protection of State waters by the prevention of new pollution and abatement of the existing conditions.

The Pennsylvania Clean Streams Act amendments of 1970 have, as an objective, the prevention of future pollution and the restoration of every stream to an unpolluted condition.

The Maryland legislature amended previous pollution regulations in 1970. The new law makes unlawful any pollution of State waters or waste discharges which violate effluent or water quality standards.

In addition to State legislative action, extensive Federal laws have been enacted to alleviate water pollution.

The Federal Water Pollution Act of 1948 cited public health issues and assigned the primary responsibility for abatement procedures to the States. In the 1956 and 1961 amendments to this law, grants were provided to fund treatment facilities.

Water quality study and planning needs were recognized in the Water Resource Research Act of 1964, and the 1965 Water Resources Planning Act. The State water resource institutes, Title II river basin commissions and the Water Resources Council were established by these acts.

Water quality standard enforcement through permits forms an integral part of present water quality management systems.

Provisions of the 1970 Water Quality Improvement Act state that dischargers into navigable waters of the United States, which otherwise need a permit, must also secure State verification that State water quality standards would not be violated.

Permit authority for discharges into navigable waters was given to the Corps of Engineers by a judicial reinterpretation of language contained in the 1899 Rivers and Harbors Act.

A more comprehensive approach to Water Quality Management was the design of the 1972 Federal Water Pollution Control Act amendments (P.L. 92-500). These amendments set timetables of 1985 for zero pollution discharge, and interim schedules for other goals. Four planning areas were set forth: Section 303e - continual planning process for water quality management to result in individual basin plans; Section 208 - area plans allowing for detailed analysis of waste management strategies in urban-industrial concentrations; Section 201 - facilities planning; and Section 209 - basin planning.

Maintaining purity in public water supplies was the concern of the Safe Drinking Water Act of 1974 (P.L. 93-523). The Act directs the Environmental Protection Agency to establish national water quality standards for public water sources.

Water pollution prevention and abatement are complicated and costly tasks. Although responsibility for water quality is with the States, Federal assistance has been necessary because of the widespread nature of water pollution problems. Improvements in water quality have been realized but continual efforts by Federal and State agencies will be required to bring about complete water quality control in the future.

Section A - Needs Determination

State water quality activities are prescribed to a great extent by Federal and State law. Water quality needs for the individual States are dictated by the Basin characteristics in their States and vary with their respective programs. For these reasons, the Water Quality Needs section of the Water Resources Program reflects overall interstate needs toward which SRBC action can be directed.

1. Improved and expanded plan and program for data collection on interstate waters.

2. An interstate water quality monitoring system to facilitate assessment of the effectiveness of State water quality programs in abating pollution of interstate waters. Identification of the non-point sources of pollution in the Basin.

a) Devise a method for quantifying nonpoint source pollution.

b) Determine criteria for nonpoint source pollution for purposes of establishing nonpoint source standards.

3. Establish priorities to guide implementation of acid mine drainage abatement programs in the Basin.

4. Coordinate the Water Quality Control and Management Programs in the Basin.

Section B - Existing Programs

The scope of water quality programs in the Basin is greatly influenced by the intrinsic pollution problems and by Federal and State legislation. Significant water quality problems in the Susquehanna River Basin are:

Inadequately Treated Sewage
Nutrient Related Eutrophication
Acid Mine Drainage Pollution
Erosion and Sedimentation

State and Federal laws that are applicable to water quality management in the Basin include:

- Article 17 and 71 - New York Environmental Conservation Law
- The Pennsylvania Clean Streams Law
- The Pennsylvania Sewage Facilities Act
- Natural Resources - Annotated Code of Maryland Articles
- P.L. 92-500 - 1972 Amendments - Federal Water Pollution Control Act
- P.L. 93-523 - Safe Drinking Water Act

Federal Agencies

CORPS OF ENGINEERS

1. Binghamton Wastewater Study

The Corps of Engineers, in cooperation with EPA and the New York State Department of Environmental Conservation, has completed the first iteration of Phase II of the Binghamton, New York Wastewater Study, scheduled to be completed in 1975. Phase I evaluated 40 strategies for wastewater management in the urban areas of Tioga and Broome Counties. Phase II refines the strategies to 12 with detailed analyses of the technologies on which the 12 alternatives are based.

2. Permits

The Corps of Engineers issues permits for discharges into navigable waters under provisions of the 1899 Refuse Act and Section 404 of the Federal Water Pollution Control Act, as amended in 1972.

3. National Assessment

The Corps of Engineers is including an inventory of water quality problems with the information collected from State and Federal agencies for the second Water Resources Council National Assessment.

UNITED STATES GEOLOGICAL SURVEY - (USGS)

1. Water Quality Monitoring

USGS has a continuous program for sampling water quality at selected sites in the Basin. USGS publishes water quality information yearly by states.

2. USGS Reports in Preparation

a) "Characteristics of Pennsylvania Recreational Lakes"

b) "Characteristics of Five Recreation Impoundments in the Susquehanna River Basin"

c) "Physical, Chemical and Biological Characteristics of First Fork Sinnamahoning Lake Drainage Basin"

3. Acid Mine Study

USGS has begun a study of acid mine drainage in the anthracite region of Pennsylvania to determine the impact of future coal mining activities on the environment.

USDA - SOIL CONSERVATION SERVICE - SCS

Many soil and water conservation districts have been organized in the basin. Contributing to sediment control are the technical assistance programs; Co-01, RC&D, and P.L. 566.

New York

a) Newton-Hoffman Creeks Project - Chemung and Schuyler Counties.

Proposed completion date is in Fiscal Year 1978. Project includes land treatment, flood retarding structures, and a pumping plant. Benefits will be derived from flood damage reduction, recreation and sediment damage reduction.

b) Patterson, Brixius and Grey Project - Broome County.

Flood water retarding structures and land treatment programs are complete. Benefits are derived from flood and sediment reduction and recreation.

Pennsylvania

a) Briar Creek Project - Columbia and Luzerne Counties.

Project will be completed in Fiscal Year 1978. Two multipurpose structures, one single-purpose reservoir, channel improvements and a land treatment program are included. Benefits will be derived from flood damage reduction, fish and wildlife and recreation.

b) Middle Creek Project - Snyder, Mifflin and Union Counties.

Nine multipurpose structures and land treatment programs are to be completed in Fiscal Year 1977. Benefits will be derived from flood damage reduction, recreation, sediment damage reduction and fish and wildlife.

ENVIRONMENTAL PROTECTION AGENCY - (EPA)

1. EPA's role is the most prominent of the Federal agencies in water quality management in the Basin.
   a) The agency serves to administer Federal environmental legislation such as P.L. 92-500 and 93-523.
   b) Establishes national quality standards for public drinking water supplies.

c) Publishes state-of-art wastewater technology reports.

d) Funds water quality related research programs.

2. National Eutrophication Survey - (NES)

The National Environmental Research Center, NERC, Corvallis and Las Vegas are conducting NES studies on the following lakes in the Susquehanna River Basin.

Goodyear Lake (Otsego County, New York)
Blanchard Reservoir (Center County, Pennsylvania)
Conewago Lake (Pinchot State Park, York County, Pennsylvania)
Harvey's Lake (Luzerne County, Pennsylvania)

The Goodyear Lake Study is complete and the remainder are in preliminary draft stage with final drafts due in the fall of 1975. The NES investigages point and nonpoint source water quality parameters.

3. Water Quality Data System

The EPA data storage and retrieval system is STORET which has been operational since 1971.

Interstate Agencies

SUSQUEHANNA RIVER BASIN COMMISSION - (SRBC)

1. Staff Project Review

Staff reviews of the following projects have been published as reports:

"Staff Review of the Baltimore District Corps of Engineers Codorus Creek Wastewater Management Study" 1973.

"Staff Review of Acid Mine Dranage Abatement in the Tioga River Basin" (as amended) 1973.

"Staff Review of Summary and Conclusions, Nutrient Transport and Accountability in the Lower Susquehanna River Basin" 1973.

"Information Report on the Stewartstown Sewage Treatment Plant" 1975.

2. Low Flow Regionalization Study

The joint SRBC-USGS Study has implications for water quality as waste dilution potential is influenced directly by flow.

3. Grant Research

SRBC has an ongoing EPA Section 106 Grant for several water quality projects related to elimination of pollution in the Basin:

a) Assessment of Interstate water quality program

This program will supplement State data collection at key stations, expand water quality monitoring and provide a basis for assessing effectiveness of the State Water Pollution Control Programs.

b) Development of a Recommended Program for Nonpoint Source Control

The program includes data collection for sediment and nutrient yields, land use data and animal densities. There are also on-going nonpoint source studies underway in New York and Pennsylvania. Additional nonpoint studies will be initiated in Maryland and Pennsylvania for 17 areas to collect data necessary for a detailed nonpoint pollution assessment.

c) Mine Drainage Program

SRBC has issued a report, "Coal Mine Drainage in the Susquehanna River Basin", in which priorities for acid mine drainage abatement were developed. The report describes the significant amount of coal mine drainage and the affected streams, and presents a cost-benefit analysis of abatement measures.

d) Conowingo Study

The staff is planning a study of nutrients and sediment above and below Conowingo Dam on the Susquehanna River in connection with the States, EPA and USGS. Supplemental data will be collected for various parameters including chlorinated hydrocarbons, heavy metals and pesticides.

4. Satellite Data Relay System

The GOES satellite platforms to be funded by SRBC are planned to be equipped to relay water quality information on a continual basis.

SRBC has funded 21 additional platforms, to be located by USGS, National Weather Service and the States. These stations will form the basis for a basinwide automated water quality monitoring system.

5. Coordination

Coordination of water quality agency activities serve to eliminate project duplication, further achieve the objectives of pollution abatement and encourage compatible interstate water quality management activities.

The SRBC staff provides input into several Federal and State committees. In Maryland, SRBC participates on

the Public Advisory Council-Government Policy Group for the Maryland Environmental Services Study of the Lower Susquehanna.

In Pennsylvania, SRBC participates on the Policy Advisory Committee, Technical Advisory Committee and the Study Advisory Committee of the DER COWAMP studies.

The SRBC staff participates in the Interagency Study Management Group of the Corps of Engineers' Binghamton Wastewater Study.

State Agencies

The following are water quality responsibilities represented by ongoing programs in all signatory States:

1. Administer water quality permit and compliance programs.

   The New York SPDES and the Pennsylvania permit program are expected to be merged with NPDES in the future. Maryland has assumed State responsibility for the NPDES Program.

2. Set Water Quality Standards

   Pursuant to law and promulgated guidelines, the three States have developed and had EPA approval of both intrastate and interstate water quality standards. Periodic review for update is required,

and is being accomplished through varying procedures for amending and revising the standards.

3. Monitoring Compliance and Enforcement Programs

Monitoring is essential to enforcement of compliance schedules. Current water quality monitoring sites in the Basin are:

a) in New York

45 by DEC

23 by USGS

6 by Broome County

1 by Elmira Water Company

4 by SRBC;

b) in Pennsylvania

120 by DER

1 by Philadelphia Electric

7 by USGS

9 by SRBC: and

c) in Maryland

41 by DNR

4 by USGS

2 by EPA

2 by Philadelphia Electric

Enforcement proceedings by Federal or State agencies may take the following form: a letter to the offender, personal telephone calls, public hearings and litigation.

4. Wastewater Treatment Program

There are 204 existing or scheduled municipal treatment plants in the Basin: 75 primary only, two intermediate primary, and 117 secondary and 10 tertiary treatment.

In general, State water quality agencies have the responsibility of developing municipal facilities priority lists for the Federally-funded construction grants. All three signatory States have completed required assessments of municipal waste treatment needs.

5. Nonpoint Source Program

States are now required by the Federal government to develop nonpoint source pollution control programs and studies as part of basin plans under P.L. 92-500.

P.L. 92-500 does not define nonpoint source but does delineate categories of sources. They include:

a) Pollutants from farming and silviculture.

b) Pollutants from active and abandoned mines.

c) Pollutants during and after construction.

d) Groundwater pollution from waste disposal in wells and sub-surface excavations.

e) Water quality degradation caused by water quantity management.

f) Salt water intrusion.

In the Susquehanna, mine drainage, heavy metals, pesticides, chlorinated hydrocarbons, nutrient enrichment and sediment are significant nonpoint sources. The States in general have varying on-going programs in sediment control, nutrient studies, and groundwater sampling and urban runoff.

6. Continuing Planning Process for Water Quality Management

Section 303e of P.L. 92-500 provides that the States develop a continuing planning process for water management.

The Basin plans mandated by Section 303e are management documents that identify basin water quality problems and propose remedial programs for pollution abatement.

Included in these plans will be:

a) Identification of the Problems
b) Priority Determinations
c) Scheduling of Compliance and Abatement Actions
d) Planning Coordination with Section 201 and 208 Plans

These plans are to enable States to develop water pollution control priorities and accumulate information useful for permit issuance purposes.

7. Quality of Public Water Supply

Public health agencies in the three States are responsible for sampling public water supplies. The various State public health departments sample public drinking water supply for a variety of substances including: toxic materials, dissolved solids, pathogens, fluorine and chlorine levels.

Under the Safe Drinking Water Act, P.L. 93-523, Federal grants are available to assist State surveillance programs.

The New York State Public Health Department in connection with the USGS has published: "A Study of Chemicals in Drinking Water from Selected Public Systems" - 1971-72.

Other Pertinent Ongoing Water Quality Programs by States

New York

DEPARTMENT OF ENVIRONMENTAL CONSERVATION - (DEC)

1. Regional Board Plan Reports

   Water quality was addressed in Regional Water Resource Planning Board reports for the Chemung and Eastern Susquehanna Basins. The reports discuss existing sewage treatment facilities and show the need for groundwater data.

2. Water quality Basin plans prepared pursuant to Section 303e of P.L. 92-500 are currently in preparation for the New York portion of the Susquehanna Basin. The Eastern Susquehanna plan will be available late in 1975.

SOUTHERN TIER CENTRAL REGIONAL PLANNING AND DEVELOPMENT BOARD

Section 208 of P.L. 92-500 provides for Areawide Wastewater Management Studies. Southern Tier Central has 208 studies underway for the Elmira-Corning area. Extensive groundwater investigation will constitute an important part of the study.

CENTRAL NEW YORK REGIONAL PLANNING AND DEVELOPMENT BOARD

This agency is conducting a Section 208 Study for Cort-

land County in the Basin. Detailed groundwater information will be contained in the study.

Pennsylvania

DEPARTMENT OF ENVIRONMENTAL RESOURCES - (DER)

1. Comprehensive Water Quality Management Plan (COWAMP). COWAMP is the water quality and wastewater management program of the State Water Plan and serves as the Section 303 continuing planning process, and includes development of information to fulfill Section 201 Facilities Plan and Section 208 Areawide Plans.

   Parts of five COWAMP areas are in the Susquehanna River Basin.

   Fundamental responsibilities of DER under COWAMP are:

   a) Coordination with Water Resources Coordinating Committee, Environmental Quality Board, Environmental Protection Agency, and Interstate Commissions.
   b) Compliance with promulgated guidelines pursuant to P.L. 92-500.
   c) Administer Clean Streams Law.
   d) Review and approve the COWAMP Basin Studies.

   Consultants to DER develop technical information from existing data and provide significant planning input into the program.

To date, the introductory chapters of these Basin plans have been prepared, and data chapters are currently being developed.

COWAMP plans consist of nine basic elements:

a) Environmental
b) Water Quality
c) Point Source
d) Institutional/Fiscal
e) Nonpoint Source
f) Monitoring and Surveillance
g) Management
h) Plan Maintenance and Update
i) Groundwater

An important element of COWAMP is an alternative environmental futures feature. Under this concept alternatives in facilities design, water management, and institutional, social and fiscal arrangements will be considered.

The Policy Advisory Committee develops alternative water quality management strategies, coordination of public participation activities and provision of planning decisions. The Technical Advisory Committee and Study Advisory Committee assists in identifying planning objectives, water quality and related problems, and provides a technical review of the study consultant's work.

The Policy Advisory Committee (PAC), Technical Advisory Committee (TAC) and Study Advisory Committee (SAC) advise DER and provide public participation for COWAMP.

2. Acid Mine Drainage Program

DER is involved in ongoing programs of abatement of acid mine drainage from abandoned mines. In the last two fiscal years, the following abatement work was undertaken

a) Three new abatement studies at a cost of $210,000.

b) 14 construction projects at a cost of $3.6 million

c) One construction project was cost-shared with EPA with Federal share totaling $220,000.

d) Two construction projects were cost-shared with the Appalachian Regional Commission (ARC) with the Federal share being $714,000. (Laurel Run & Spring Run)

3. Water Management Information Systems (WAMIS & G-WAMIS)

These are the DER computer systems for data on individual and municipal waste discharges and public water supply. G-WAMIS stores information on Pennsylvania water supply wells and springs and some groundwater quality data.

Maryland

DEPARTMENT OF HEALTH

1. Sewer Plans

The Maryland Health Department assists counties in the annual update of water and sewer plans, pursuant to State law. These plans designate water and sewer service areas and identify the need for facilities.

DEPARTMENT OF NATURAL RESOURCES - (DNR)

1. Service Region Wastewater Purification Plans

The plans contain information on the most economical wastewater management and ownership schemes as well as an identification of needed projects.

2. Water Quality Management Basin Plans

The Maryland basin plans pursuant to Section 303e contain an inventory of point sources, significant discharge analysis, and assessments of needs by basin. The Lower Susquehanna plan is presently in draft form.

Section C - Assessment

General Assessment

Although Water Quality Management has been traditionally considered to be mainly a public health problem, a growing awareness of other aspects of water quality degradation has surfaced. State and Federal agencies have instituted a wide variety of water purity reclamation programs, and Federal and State legislation has served to strengthen and expand existing pollution abatement strategies in the States.

Efforts at point source and sediment control in the last few years have resulted in sediment load de-

crease and a noticeable increase in dissolved oxygen.

Primarily the structural emphasis has been on constructing individual community sewage treatment plant facilities and upgrading existing systems. Recently, the possibility of regional collection and treatment facilities has become a feasible, technological alternative.

The recognition of nonpoint sources as significant water polluters will necessitate increased coordination of some programs in widely separated State agency bureaus.

EPA has the resources to fund research on new industrial processes and waste treatment plans aimed at generating fewer pollutants at the source.

EPA has sponsored studies and demonstration projects for acid mine pollution abatement, and partially funded some abatement construction to supplement State funding of such projects.

In general, water quality management activities by both State and Federal agencies in the Susquehanna River Basin and elsewhere have been stepped up in recent years in response to legislation and the awareness of the magnitude of water quality problems.

Specific Assessments

1. Need - Data Collection

   a) Frequency of sampling is not sufficient for some stations to provide satisfactory record of water quality.

   b) Sampling sites have been relocated or discontinued limiting the period of record for such sites.

   c) Important water quality parameters are not included at some sampling stations. Only limited use has been made of automated data collection.

2. Need - Interstate Water Quality Monitoring System

   a) Monitoring and enforcement programs are the main tools in achieving water quality goals under the permit system. Often monitoring has been incomplete.

   b) There is no reliable method for quantifying nonpoint source pollution.

   c) Basic data insufficiencies limit capability to establish criteria and standards on nonpoint source pollution.

3. Need - Acid Mine Drainage Abatement

   a) Acid mine drainage from abandoned mines continues

as a major source of pollution in the Susquehanna River and certain of its tributaries. Abatement efforts while commendable are not sufficient to eliminate the problem in the reasonably foreseeable future.

b) The high cost of abatement project construction severely limits the number of projects which can be accomplished with available funds.

4. Need - Coordination

a) Interstate and basinwide coordination of water quality management programs is limited.

Section D - Recommended Programs

General Recommendations

The interdependencies of water quality, water supply, and land resources dictate that a comprehensive management approach be employed by State and Federal agencies. Essential to a comprehensive approach is the integration and coordination of activities occurring in widely dispersed program areas.

An efficient compliance and enforcement system is necessary for an effective discharge permit program. Uniform application and enforcement of permit provisions should be stressed.

As groundwater sources become more important for water supply purposes, emphasis should be placed on prevention and abatement of groundwater pollution through expansion of present management programs.

The present trend toward regionalized sewage treatment and collection facilities should be continued and applied where feasible. Regional systems generally have the potential to provide greater efficiency in sewage treatment operations.

Proposed SCS sediment control programs should be implemented to further reduce sediment pollution in the Susquehanna River Basin. Past success with the land treatment approach to reducing sediment loads warrants expansion of existing programs.

The Environmental Protection Agency should continue research aimed at developing processes which can recycle waste materials and aid in eliminating them at the source. Emphasis should be extended from rehabilitation of polluted water to reduction of the production of pollutants.

The importance of exploring alternative water quality management strategies should not be overlooked.

Specific Recommendations

1. Need - Data Collection

   a) SRBC should coordinate data collection among the signatory States and the Federal government on interstate waters.

   b) Basin States in cooperation with USGS and SRBC should establish permanent sampling stations to insure a uniform record for water quality parameters resulting in meaningful data.

   c) Increase the number of GOES data transmission platforms and outfit them with water quality instrumentation.

2. Need - Interstate Water Quality Monitoring System

   a) USGS and SRBC should install permanent monitoring equipment on interstate waters, perhaps in connection with the GOES platforms.

   b) SRBC should collect information necessary to assess the various state water quality control management programs.

   c) SRBC should coordinate development of methods and models for quantifying nonpoint pollution information so that criteria can be established for setting nonpoint source standards.

3. Need - Acid Mine Drainage

a) The SRBC should establish abatement priorities in the Basin, in cooperation with the States and EPA and update the list annually.

b) Encourage Federal government, through EPA, ARC, and the Corps to fund and implement abatement projects selected from the priority list.

4. Need - Coordination

a) SRBC should provide interstate coordination of water quality management through project review, participation on project working committees and conducting an information exchange program among States.

b) Coordinate and participate in monitoring of ongoing mine drainage abatement projects and coal mining activites, and assess water quality improvement resulting from them.

CHAPTER FIVE: OTHER PROGRAM AREAS

The remaining Program Areas - Recreation, Fish and Wildlife; Watershed Management and Protection; and Cultural, Visual and other Amenities will be dealt with in this chapter. Due to the absence of any explicit and substantive Commission activity in these areas, no attempt has been made for this year's Water Resources Program to determine the quantity or quality of needs, nor to conduct an exhaustive survey and assessment of existing and proposed programs. Recommendations included pertain solely to the Commission.

The general objectives and value of continuing activity in these resource areas need not be reviewed here, as the Comprehensive Plan presents a clear though broad basis for program development and implementation.

Key agency programs, directions, and the role of the Commission will be briefly identified for each area. It should be understood that next year's Water Resources Program will more completely address these three areas.

Section A - Recreation, Fish and Wildlife

Major planning activities include:

1. Revision of Pennsylvania's State Comprehensive Outdoor Recreation Plan.

2. Pennsylvania State Water Plan

3. Chemung River Basin Regional Board Plan

4. Eastern Susquehanna River Basin Regional Board Plan

5. Pennsylvania Wild and Scenic Rivers System - designation and study.

6. Deer Creek, Maryland, Management Plan (Maryland Scenic Rivers System)

7. Pine Creek Task Force (Pennsylvania DER) and Pine Creek Wild and Scenic River Study (U.S. Department of Interior-BOR)

8. New York Statewide Comprehensive Outdoor Recreation Plan

In addition, recreation and/or open space plans are being or have been prepared at the county and regional level throughout the Basin. Major fish and wildlife activites are being carried out by the signatory States' fish and game commissions or administration.

Aside from statewide recreation plans, critical areas planning is a current direction in natural resources planning which will play a significant role in the recreation, fish and wildlife program area. "Critical areas" generally are defined as geographic areas or resources of particular environmental or economic value. Pennsylvania and Maryland have both initiated "critical areas" planning programs, beginning with the establish-

ment of criteria for their identification. After identification and evaluation, policy recommendations for the proper management of these areas will be submitted.

The Commission, through consultation and coordination with the appropriate Federal and State agencies, should begin to formulate more precisely its role in the preservation and management of recreation, fish and wildlife resources. To develop a program in this area, the Commission should take the following steps:

Recommendations

1. Analyze the existing and potential supply of and demand for recreation, fish and wildlife resources.

2. Examine agencies' current management policies and plans to develop and recommend and assure an optimum program of preservation, conservation and development of these resources.

3. Develop a data base and methodology for evaluating the impact of man's activities on recreation, fish and wildlife resources for its project review responsibilities.

4. Identify specific locations of existing or impending critical resource use conflicts and develop a plan of action to avoid or ameliorate adverse effects.

Section B - Watershed Management and Protection

The purposes and objectives of watershed management and protection are being accomplished in part through interaction with several program areas, e.g., flood plain management and protection, water supply, etc. Major activities include SCS P.L. 566 Small Watershed Projects, Land Treatment Programs, and Soil Surveys. The P.L. 566 Projects were previously listed in Chapter Two, Part Two. County Soil Surveys completed in the Basin are included in Appendix C. The following are in progress.

1. Unpublished Detail Survey

New York

a) Steuben

b) Onondaga

Pennsylvania

a) Centre (Interim Report)

b) Cumberland (Interim Report)

c) Franklin (Interim Report)

d) Huntingdon (Interim Report)

e) Juniata (Interim Report)

f) Lackawanna (Interim Report)

g) Luzerne (Interim Report)

h) Mifflin (Interim Report)

i) Snyder (Interim Report)

j) Tioga (Interim Report)

k) Lebanon County (Interim Report)

l) Wyoming County (Interim Report)

2. Incomplete Detailed Survey

New York

a) Chenango - To Be Published in 1979

b) Otsego - Not Planned for Publication Until After 1980

c) Delaware - Not Planned for Publication until After 1980

d) Madison

e) Schuyler

Pennsylvania

a) Bedford County (Interim Report)

b) Bradford County (Interim Report)

c) Cameron County

d) Clearfield County (Interim Report)

e) Elk County

f) Lycoming County

g) McKean County

h) Montour-Blair Counties (Interim Report)

i) Northumberland County (Interim Report)

j) Perry County (Interim Report)

k) Schuylkill County - FY-1976

l) Sullivan County - (Interim Report)

m) Union-Cambria Counties (Interim Report)

n) Wayne County (Interim Report)

There are also programs at the state and local level which, through planning and technical assistance and standards, attempt to control erosion and sedimentation.

Although the major management and protection activities are directed toward rural, relatively undeveloped watersheds, increasing attention must be paid to the concentrated web of needs, difficulities, and opportunities in the management of urbanized watersheds.

Recommendations

The Commission should evaluate the present range of agencies' programs, identify possible alternative management and protection approaches, and identify specific rural and urban watersheds which are in need of a comprehensive management program. The Commission should work to improve communication and coordination among the several agencies and local governments which may be involved in various plans and projects within a single watershed and among adjacent watersheds.

Section C - Cultural, Visual and Other Amenities

All water resource development projects and projects which impact on water and related resources affect in varying manner and magnitude the cultural, visual and other amenities of the Basin. Federal and State environmental legislation of recent years has mandated the consideration of project impacts on such values and more importantly has sought to bring these values more directly into agencies' planning processes. Existing historical, cultural and archeological preservation programs require continuing support and expansion. The Wild and Scenic Rivers Programs, both Federal and State, will identify streams

whose scenic and other natural amenities merit explicit preservation and management measures.

The incorporation of the value of cultural, visual and other amenities has been less than satisfactory in terms of fully identifying and weighing the relative worth of these resources. The cursory treatment of these resources has been due, in part, to the difficulty of placing economic values on subjective values.

The value of these resources will be directly dealth with by the Commission in its review of projects. This activity has only recently been formally initiated. The Commission has yet to create for its own utilization a method for identifying and evaluating the impact of various projects on these values. The Commission's concern is not only that these values be taken into consideration in the planning and implementation of projects, but that more positively these values should be promoted and preserved on the basis of their intrinsic worth as a vital element of our total environment.

Recommendations

Water Resources agencies, individually and collectively, must identify points or stages in water resources planning and management which affect, both positively and negatively, the quality of cultural, visual and other amenities. The Commission should sponsor a task force or study group to address the more crucial questions, including a determination of the role, value,

1 benefits and relative worth of open space, historic sites, scenic
2 vistas, wild and scenic stream reaches and other natural amen-
3 ities in terms of competing uses and the planning objectives of
4 water resource agencies. As a product of this effort, the Com-
5 mission should establish an explicit procedure for evaluating
6 the conflicts among the many and diverse water resource values
7 which would additionally clarify the role of these values in the
8 decision-making process.

APPENDIX A

CURRENT FLOOD PROTECTION PROJECTS
AND STUDIES BY AGENCIES

CORPS OF ENGINEERS

PROJECT OR STUDY	TYPE OF PROJECT	STAGE	REMARKS
Tioga-Hammond	Reservoirs	Construction	Completion Date-1978
Cowanesque	Reservoir	Construction	Completion Date-1980
Wyoming Valley	Levee, Flood-wall	Survey Study Completed	Before Secretary of the Army for review
Harrisburg	Levee and Flood-wall, Channel Improvements	Survey Study	
Lock Haven	Levee and Flood-wall	Survey Study	Before Chief of Engineers for review
Flood Control Review Study	Basinwide Structural and Non-structural System	Study	Completion Date FY-1977
Milton	Not Yet Determined	Survey Study	
Marathon	Channel Improvement	Final Stage of Survey Study	Completion of Study December-1975
Bull Run	Levee and Pumping Station	Detailed Project Study Underway	Completion of Study May 1976
Painted Post	Levee	Reconnaissance Report Completed	Report recommends raising of existing levee project

CORPS OF ENGINEERS - (Continued)

PROJECT OR STUDY	TYPE OF PROJECT	STAGE	REMARKS
Brookside	Levee	Reconnaissance Report Completed	
Middletown		Reconnaissance Report to begin, Summer 1975	
Big Creek		Reconnaissance Report to begin Fall 1975	
Endicott, Johnson City, Vestal	Levee, Floodwall	Review of existing project underway	
Hornell	Levee, Floodwall	Review of existing project planned	

USDA
SOIL CONSERVATION SERVICE

Little Choconut, Finch Hollow Trout Brook	Floodwater retarding structures, debris control, land treatment	Construction Completed	
Marsh Ditch	Floodwater retarding structure, channel improvement, land treatment	Construction Completed	

SOIL CONSERVATION SERVICE - (Continued)

PROJECT OR STUDY	TYPE OF PROJECT	STAGE	REMARKS
Nanticoke Creek	Floodwater retarding structures, land treatment	Construction	Completion Date FY-1980
Newtown-Hoffman Creek	Single and multipurpose flood water retarding structures, pumping plant and land treatment	Construction	Completion Date FY-1978
Patterson, Brixius Grey Creeks	Flood water retarding structures, land treatment	Construction Completed	
Mill Brook		Planning	
Briar Creek	Single and multipurpose retarding structures, land treatment	Construction	Completion Date FY-1978
Middle Creek	Multipurpose structures, land treatment, channel improvement	Construction	Completion Date FY-1978
Nescopeck Creek	Multipurpose retarding structure, land treatment	Construction	Completion Date FY-1978
Upper Tioga River	Non-structural measures	Planning	
Chickies Creek		Application Approved	Approved 1970
Cowanesque River Tributary		Application Approved	Approved 1955
Kishacoquillas Creek		Application Approved	Approved 1973

SOIL CONSERVATION SERVICE - (Continued)

PROJECT OR STUDY	TYPE OF PROJECT	STAGE	REMARKS
Quittapahilla Creek		Application Approved	Approved 1973
Wiconisco Creek		Application Approved	Approved 1973
Bentley Creek		Application Approved	Approved 1965

NEW YORK - DEC

Gang Mills	Levees, interior drainage measures	Final Design	

PENNSYLVANIA - DER

Blakely	Channel Improvement	Construction	Hull Creek; Completion Date August-1975
Huntingdon-Smithfield	Levees and pumping Station	Construction	Juniata River; Completion Date December 1975
Everett	Improve interior drainage behind existing levees	Construction	Raystown Branch Juniata River; Completion Date Summer-1975
Wyoming and West Wyoming	Channel Improvement	Design	Abrahams Creek

PENNSYLVANIA - DER (Continued)

PROJECT OR STUDY	TYPE OF PROJECT	STAGE	REMARKS
Swoyersville and Forty-Fort	Channel Improvement, minor levee	Design	South Branch Abrahams Creek and Wade Run
Danville	Channel Improvement, levee and wall	Design	Sechler Run
Danville	Levee, raising of existing levee	Design	Susquehanna River
Coalport	Channel Improvement, levee	Design	Clearfield Creek
Duryea	Levee	Design	Lackawanna River
Luzerne	Retaining Wall	Design	Toby Creek
Lawrenceville	Rip-rap existing levee	Design	Tioga River
Wilkes-Barre	Channel Improvement	Design	Spring Run
Williamsburg	Channel Clearing	Planning	Frankstown Branch Juniata River
Athens	Raise, Rehabilitate existing levee	Planning	Chemung River
Castenea	Rehabilitate existing wall, channel improvement	Planning	Harvey's Run
Catawissa	Levee	Planning	Catawissa Creek and Susquehanna River

PENNSYLVANIA - DER (Continued)

PROJECT OR STUDY	TYPE OF PROJECT	STAGE	REMARKS
Mount Holly Springs		Planning Recently Initiated	Mountain Creek
Highspire	Channel Improvement	Planning	Bird Run
Moosic	Levee	Planning	Spring Brook
Old Forge	Channel Improvement	Planning	St. Johns Creek
Dickson City	Channel Improvement	Planning	Scott Creek
Luzerne	Channel Improvement, wall	Planning	Toby Creek
Ashley	Channel Improvement	Planning	Solomon Creek
Jessup	Channel Improvement	Planning	Sterry Creek
Newport Township and Nanticoke City	Channel Improvement, siltation prevention measures	Planning	South Branch Newport Creek
Reedsville		No specific measures identified	Honey Creek
Upper Augusta	Levee	Planning	Little Shamokin Creek
York	Channel Improvement	Planning	Tyler Run
Everett	Siltation prevention measures	Planning	Bloody Run

PENNSYLVANIA - DER (Continued)

PROJECT OR STUDY	TYPE OF PROJECT	STAGE	REMARKS
Hollidaysburg	Channel Improvement	Planning	Beaver Dam Branch of Frankstown Branch Juniata River
Emporium	Channel Improvement, raise existing levee	Planning	Driftwood Branch Sinnemahoning Creek
Woolrich	Channel Improvement	Planning	Chatham Run
Taylor		Planning Recently Initiated	Keyser Creek
Wilkes-Barre and Hanover Township	Channel Improvement, other measures	Planning	Solomon Creek (Goose Island Area)
Jersey Shore	Channel Improvement	Planning	Lawshe Run and Pfouts Run
Swatara	Retention	Planning	Spring Creek working with SCS
Altoona	Channel Improvement	Planning	Spring Run
Exeter Borough	Channel Improvement	Planning	Hicks Run
Hop Bottom	Channel Improvement, slope stabilization	Planning	Unnamed tributary to Martins Creek

APPENDIX B
CURRENT FLOOD PLAIN MANAGEMENT PROGRAMS BY NEED AND OTHER RELATED AGENCY PROGRAMS

Need 1 - Mapping

Federal	
HUD - Development of Housing and Urban Development FIA - Federal Insurance Administration	Administers flood insurance program. Funds type 15 flood insurance program which stresses mapping of flood plain in order to determine insurance rate maps based on risk and delineations of flood elevations for community use.
COE - U.S. Army Corps of Engineers	Conduct mapping for flood plain information reports. (See Appendix)
SCS - Soil Conservation Service	Prepares some type 15 flood insurance studies.
USGS - U.S. Geological Survey	Prepares flood prone maps with 100-year delineation. Assists in funding data collection efforts and gaging stations. Includes flood summary reports and inundation maps. Determine magnitude and frequency of flood events and regional flood frequency relationships. Has prepared a type 15 study for Selinsgrove, Pennsylvania.
Interstate	
SRBC - Susquehanna River Basin Commission	Contracted with HUD to prepare type 15 studies for communities in the basin. Flood plain assessment reports to determine 100-year flood plain populations from mapping. (See Appendix)
State	
New York	
OPS-DEC - Office of Planning Services, Dept. of Environmental Conservation	Fund FI studies for some New York communities. LUNR land use classification which may be beneficial in assessing land use and flood damages. (See Appendix)
Pennsylvania	
OSPD - Office of State Planning and Development	Flood plain information reports. Regional and State fund with ARC funds. Flood insurance studies.

Need 2 - Optimum Basinwide Mix of Structural and Nonstructural Measures

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Federal

COE - U.S. Army Corps of Engineers

For structural projects. (See Figures and Tables and Appendices)

Basinwide Flood Control Review Study:

a. To determine the most economical and efficient program to reduce flood losses.

b. Updated stage - damage curves.

c. Systems analysis of existing and potential reservoirs.

d. Recommended flood damage reduction plan for the basin to include structural and nonstructural measures.

e. Pilot study at Binghamton, New York for formulation of nonstructural measures.

Flood Plain Information Reports in Progress:

New York

a. Susquehanna River, Nichols, Tioga Co.

b. Chenango River, Greene, Chenango Co.

Pennsylvania

a. Frankstown Branch-Juniata River, Frankstown, Blair Co.

b. Frankstown Branch-Juniata River, Claysburg, Blair Co.

Federal	
SCS - Soil Conservation Service	P.L. 566 Projects. (See Appendix) RC&D Projects. (See Appendix) Streambelt Corridor Studies - for all towns in Broome and Tioga Counties, New York.
HUD - Development of Housing and Urban Development	Administers national flood insurance program. (A nonstructural alternative)
FIA - Federal Insurance Administration	
Interstate	
SRBC - Susquehanna River Basin Commission	Conducts studies for flood insurance program. Participation in Pennsylvania State Water Resources Coordinating Committee: Flood Plain Management Subcommittee. Flood Plain Management Technical Task Force. Flood Plain Management Administration and Implementation Task Force. Contributed to development of technical manual on flood plain management.
State	
New York	
OPS - Office of Planning Services (Disbanded)	Flood plain management technical planning services. Provides technical planning assistance for land use control and other FPM means.
DEC - Dept. of Environmental Conservation	Funds FI studies. Final design stage - Gangs Mills LFP Project, Chemung Co. Chemung and Eastern Susquehanna Regional Water Resources Planning Board Report. Emphasizes Section 73 measures.

State	
Pennsylvania	
OSPD - Office of State Planning and Development	Funds studies for FI program. (A non-structural alternative.
DER - Dept. of Environmental Resources	Flood Control Projects: Blakely Borough, Lackawanna Co., channel improvement. Huntingdon Borough and Smithfield Township, Huntingdon County, (levee) pumping. Everett Borough, Bedford County, drainage and pumping. State Water Plan: a. In flood plain management area will establish priority list of urgent areas need for flood protection. b. Identify feasible alternative approaches (consider range of strategies)
DCA - Dept. of Community Affairs	Serves as State coordinating agency for National Flood Insurance Program.
Maryland	
DNR Dept. of Natural Resources	State coordinating office of National flood insurance program.

Appendix B (Cont'd)

Need 3 - Flood Plain Regulation

Federal	
HUD - Development of Housing and Urban Development	Regulations by flood prone communities are part of the National Flood Insurance Program.
FIA - Federal Insurance Administration	
WRC - Water Resources Council	Regulation of flood hazard areas to reduce flood losses. A unified national program for flood plain management. The draft document addresses regulations useful to mitigating flood losses
Interstate	
SRBC - Susquehanna River Basin Commission	Produces assessment reports which discuss the adequacy of local regulations on several communities of meeting minimum standards of the flood insurance program.
States	
New York	
OPS - Office of Planning Services (Disbanded)	Provided technical planning aid for flood plain regulations. (Codes and ordinances)
DEC - Dept. of Environmental Conservation	Provide technical assistance for regulations under N.Y. State flood plain management law.
Pennsylvania	
DCA - Dept. of Community Affairs	Assist localities with flood plain regulations.
Maryland	
DSP-DNR - Dept. of State Planning, Dept of Natural Resources	Published regulations of flood prone lands in Maryland which reviews local regulations of flood plains by county.

Need 4 - Flood Forecasting and Warning

Federal	
USGS - U.S. Geological Survey	Reports issued in 1972 flood in Elmira and Corning.
New York	Low flow studies of Chenango River at Unadilla, Fenton, and Chenango (Broome County).
	Hydraulic analysis of Chenango River.
Pennsylvania	In cooperation with SRBC establish GOES satellite platforms.
	Evaluate data from ERTS system.
	Low flow regionalization with SRBC.
All	Maintains gaging system to provide data for flood forecasting.
NWS - National Weather Service	Assist in planning and implementation of forecasting and warning systems in Steuben and Chenango Counties
New York	
Pennsylvania	Maintain radar at Harrisburg River Forecasting Center.
	Assisted with self-help forecasting and warning system in Swatara Creek Watershed.
All	Instituted radio warning system.
	Has added sophisticated data collection and analysis equipment.
Interstate	
SRBC - Susquehanna River Basin Commission	Coordinates and assists in planning and implementation of self-help program in Steuben and Chenango Counties.
New York	
Pennsylvania	Assists with self-help program in Swatara Creek Watershed.

Interstate	
All	Co-fund with USGS, NWS and States, the purchase, installation and maintenance of 21 GOES platforms. Hydrologic Data Coordinating Commitee: a. Discusses flood frequency analysis and application. b. Coordinates hydrologic methods among States and Federal agencies in basin.
States	
All	Co-fund satellite platforms. Participate in hydrologic data coordinating committee.

Need 5 - Emergency Measures

Federal	
All	Provide emergency resources and assistance
States	
New York	Office of Disaster Preparedness-Division of Military and Naval Affairs. a. Coordinates natural disaster planning and operations between all levels of government in the State. b. Administers programs of Defense Civil Preparedness Agency and Federal Disaster Assistance Administration. c. The State's emergency operations planning is currently undergoing revision.
Pennsylvania	State Civil Defense Council. a. Coordinates emergency planning at all government levels in the State. b. Administers Defense Civil Preparedness and Federal Disaster Assistance Administration program. c. Published State Disaster Operations and Assistance Plan.
Maryland	Civil Defense and Emergency Planning Agency. a. Coordinates emergency activities in the State. b. Administers Defense Civil Preparedness and Federal Disaster Assistance Programs. c. State's emergency operations plan is now being revised.
New York (Regional)	Southern Tier Central Regional Planning and Development Board. Serves as a coordinator with County Civil Defense groups in the identification of goals, objectives and guidelines for emergency plans.

Need 5 - Emergency Measures

States	
New York	Office of Disaster Preparedness - Division of Military and Naval Affairs. a. Coordinates natural disaster planning and operations between all levels of government in the State. b. Administers programs of Defense Civil Preparedness Agency and Federal Disaster Assistance Administration. c. The State's emergency operations planning is currently undergoing revision.
Pennsylvania	State Civil Defense Council. a. Coordinates emergency planning at all government levels in the State. b. Administers Defense Civil Preparedness and Federal Disaster Assistance Administration program. c. Published State Disaster Operations and Assistance Plan.
Maryland	Civil Defense and Emergency Planning Agency. a. Coordinates emergency activities in the State. b. Administers Defense Civil Preparedness and Federal Disaster Assistance Programs. c. State's emergency operations plan is now being revised.
New York (Regional)	Southern Tier Central Regional Planning and Development Board. Serves as a coordinator with County Civil Defense groups in the identification of goals, objectives and guidelines for emergency plans.

Other Related Agency Programs

Federal	
SCS - Soil Conservation Service	Soil Surveys. (See Appendix C)
New York	Streambelt corridor studies for Broome and Tioga Counties.
	Resource conservation and development projects (RC&D). (See Appendix)
Pennsylvania	Resource conservation and development projects. (See Appendix)
	Soil surveys. (See Appendix)
USGS - Geological Survey	
Pennsylvania	Produced type 15 flood insurance study for Selinsgrove.
All	Delineate 100-year flood plain on flood prone maps.
HUD - Housing and Urban Development	
All	Disaster Urban Renewal Program. Provides funds for renewal under Disaster Relief Act of 1972. (See page 37, table 4.
	Comprehensive planning assistance under Section 701 of Housing Act of 1954.

States	
New York	
OPS-DEC - Office of Planning Services and Dept. of Environmental Conservation ORS	Flood recovery planning assistance. Coordinated Federal funding projects. LUNR update pilot project system applied to restudy land use in Broome and Tioga Counties.
DEC - Dept. of Environmental Conservation	Flood recovery: a. Pilot relocation feasibility for Owego. b. Small watershed studies. Regional Water Resources Planning Board - Chemung and Eastern Susquehanna. The plans include recommendations for flood reduction measures.
Pennsylvania	
OSPD - Office of State Planning and Development	Study of flood damage impact on railroad lines. Disaster recovery information as input into the State Water Plan.
DER - Dept. of Environmental Resources	State Water Plan: Establishes priorities for flood protection and promotes flood plain management.
DCA - Dept. of Community Affairs	Assists and monitors federally and state funded disaster renewal projects. Assists on flood plain acquisition in communities through the Project 500 program.
Maryland	
DSP - Dept. of State Planning	Federal funds for recovery planning disbursed through Flood Disaster Coordination Office. The State development plan includes identification of flood plain by soil types and areas of critical concern.

States	
Maryland	
DNR - Dept. of Natural Resources	Flood Recovery Program. a. Storm water management manual. b. Regulating flood prone land in Maryland. c. Report on response of State agencies during Agnes.

APPENDIX C

COMPLETED FLOOD CONTROL
PROJECTS AND REPORTS

U. S. ARMY CORPS OF ENGINEERS

1. Reservoirs	Drainage Area (Sq. Mi.)
Almond Lake - Flood Control, Recreation	56
Alvin R. Bush Dam - Flood Control, Recreation	226
Arkport Dam - Flood Control	31
Aylesworth Creek Lake - Flood Control, Recreation	6.2
Curwensville Lake - Flood Control, Recreation	365
East Stidney Lake - Flood Control, Recreation	102
Foster Joseph Sayers Dam - Flood Control, Recreation	339
Indiana Rock Dam - Flood Control	94
Raystown Lake - Flood Control, Recreation	960
Stillwater Lake - Flood Control, Water Supply	36.8
Whitney Point Lake - Flood Control, Recreation and Wildlife Management	225

2. Local Flood Protection Projects

Addison - Levee and Wall
Addison - Emergency Bank Protection
Avoca - Levee, Channel Improvement
Bainbridge - Channel Improvement
Bath - Levee and Wall
Binghamton - Levee and Channel Improvement
Binghamton - Channel Improvement
Canisteo - Levee and Channel Improvement
Cincinnatus - Channel Improvement
Conklin-Kirkwood - Channel Improvement
Corning - Levee, Wall, Channel Improvement
Corning (Monkey Run) - Channel Improvement
Cortland - Channel Improvement
Elkland - Levee, Channel Improvement
Elmira - Levee, Wall, Channel Improvement
Endicott, Johnson City, Vestal - Levee, Wall, Channel Improvement
Greene - Levee, Wall, Channel Improvement
Hornell - Levee, Wall, Channel Improvement
Kingston-Edwardsville - Levee, Wall, Channel Improvement
Lisle - Levee, Wall, Channel Improvement
Milton - Channel Improvement
Nichols - Levee
Norwich - Channel Improvement
Oneonta - Channel Improvement
Owego - Channel Improvement
Oxford - Levee, Channel Improvement
Painted Post - Levee, Wall, Channel Improvement
Plymouth - Levee, Channel Improvement
Port Dickinson - Channel Improvement
Scranton - Levee, Wall
Sherburne - Channel Improvement
Sunbury - Levee, Wall
Swoyersville-Forty Fort - Levee, Wall, Channel Improvement
Tyrone - Levee, Wall, Channel Improvement
Unadilla - Levee, Channel Improvement
Whitney Point - Levee, Channel Improvement
Wilkes-Barre-Hanover Township - Levee, Wall
Williamsport - Levee, Wall, Channel Improvement
York - Levee, Channel Improvement

3. Flood Plain Information Reports

New York

Susquehanna River - Owego, Tioga County (14 miles)

Susquehanna River (25 miles) and Chenango River (9 miles) Binghamton, Broome County

Susquehanna River - Windsor and Colesville Towns, Broome County (20 miles)

Chenango River - Fenton and Chenango Towns, Broome County

Chemung River, Part 1 - Elmira, Chemung County (Preliminary - 14 miles)

Chemung River (22 miles) and Seeley Creek (4 miles), Part 2 - Wellsburg, Chemung County, (Preliminary)

Chemung River - Corning, Steuben County, (Preliminary - 18 miles)

Pennsylvania

Lycoming Creek, Lycoming County (10 miles)

Loyalsock Creek, Lycoming County (11 miles)

West Branch Susquehanna River-Williamsport, Lycoming County (13 miles)

West Branch Susquehanna River (7 miles) and Bald Eagle Creek (8 miles) - Lock Haven area, Clinton County

Susquehanna River - Bloomsburg, Columbia County, (12 miles)

Mill Run - Altoona, Pennsylvania, Blair County, (7 miles)

West Branch Susquehanna River - East Lycoming County (13 miles)

Frankstown Branch Juniata River-Williamsburg, Blair County (Preliminary - 6 miles)

Susquehanna River - Shickshinny, Luzerne County, (2 miles)

Susquehanna River - Nanticoke, Luzerne County

Susquehanna River - Wilkes-Barre, Luzerne County

SOIL CONSERVATION SERVICE

1. P.L. 566 Projects

New York

a) Dean Brook Project, Tioga and Chemung Counties

Completed in FY-1961. Area - 6,320 acres. Project includes two single-purpose flood prevention dams, channel improvement, debris basins and a land treatment program. Benefits to flood and sediment damage reduction.

b) Great Brook Project, Chenango County

Area 16,768 acres. Project includes one single-purpose flood prevention dam, channel improvement, debris basins, road bank stabilization and a land treatment program. Benefits to flood and sediment damage reduction.

c) Upper Fivemile Creek Project, Steuben and Yates Counties

Area 38,100 acres. Project includes dike and levee, stream improvement, debris basin, pumping plant and a land treatment program. Benefits to flood and sediment damage reduction.

d) Genegantslet Creek Project, Chenango County

Area 66,457 acres. Project includes one multipurpose dam, trout stream improvement, one single-purpose wildlife structure and a land treatment

program. Benefits to flood and sediment damage reduction, and fish and wildlife.

Pennsylvania

a) Marsh Creek Project, Tioga County

Completed in FY-1972. Area 52,940 acres. Project includes one single-purpose flood water retarding structure, two multipurpose structures, one basic recreation facility, and a land treatment program. Benefits to flood damage reduction, recreation, water supply, fish and wildlife, and sediment damage reduction.

b) Martin Creek Project, Susquehanna County

Completed in FY-1970. Area 31,680 acres. Project includes two flood water retarding structures, one flood water diversion, and a land treatment program. Benefits to flood damage reduction.

c) Mill Creek Project, Tioga County

Completed in FY-1968. Area 8,430 acres. Project includes two flood water retarding structures, one multipurpose structure, and a land treatment program. Benefits to flood damage reduction and fish and wildlife.

d) North Fork of Cowanesque River Project, Potter County

Completed in FY-1967. Area 7,650 acres. Project includes one flood water retarding structure and

a land treatment program. Benefits to flood damage reduction and sediment damage reduction.

Maryland

a) Little Deer Creek Project, Harford County

Completed in FY-1970. Area 10,112 acres. Project includes 4 single-purpose flood prevention dams and a land treatment program. Benefits to flood and sediment damage reduction.

2. Completed Soil Surveys

New York

Allegany
Broome
Chemung
Cortland
Tioga
Tompkins

Pennsylvania

Adams
Berks
Clinton
Columbia
Chester and Delaware
Fulton
Indiana
Jefferson
Lancaster
Potter
Susquehanna
York

3. Resource Conservation and Development Projects

New York

Southcentral New York - Broome, Chenango, Madison, Cortland, Delaware, Otsego, Tioga and Tompkins Counties.

a) Hardy Road Flood Control - Broome County
b) Perplexity Creek - Flood Prevention, Cortland Co.

Sullivan Trail - Steuben, Chemung, Schuyler Cos.

Measures adopted by Executive Board:

a) Prospect Creek Flood Prevention - Chemung Co.
b) Special Resources Study - 1972 County Wide Flood Damages
c) Special Resources Study of Agricultural Flood Damages

Pennsylvania

Endless Mountains - Susquehanna, Wyoming, Bradford and Tioga Counties.

Under consideration:

a) Elkland land drainage and Camp Brook
b) Springville Flood Prevention - Susquehanna Co.

Headwaters - Potter, McKean, Elk, Cameron, Jefferson and Clearfield Counties.

Applications:

Pocono Northeast - Luzerne, Lackawanna, Schuylkill, Wayne, Pike, Monroe and Carbon Counties.

Southern Allegany - Huntingdon, Fuller, Blair, Bedford, Cambria and Somerset Counties.

SUSQUEHANNA RIVER BASIN COMMISSION

1. Completed Flood Insurance Studies

New York

Ashland Town
Big Flats Town
Binghamton City
Conklin Town
Chemung Town
Corning City
Corning Town
Dickinson Town
Elmira City
Elmira Town
Endicott Village
Erwin Town
Johnson City Village
Kirkwood Town
Owego Town
Owego Village
Painted Post
Port Dickinson Village
Riverside Village
South Corning Village
Southport Town
Union Town
Vestal Town
Wellsburg Village

Pennsylvania

Annville Township
Athens Borough
Bellefonte Borough
Buffalo Township
Burnham Borough
Camp Hill Borough
Castanea Township
Cleona Borough
Conyngham Township
Danville Borough
Dauphin Borough
Derry Township (Dauphin County)
Derry Township (Mifflin County)
Duboistown Borough
Dunstable Township
East Buffalo Township
East Pennsboro Township
Edwardsville Borough
Exeter Borough
Fairview Township
Flemington Borough
Forty-Fort Borough
Granville Township
Gilberton Borough
Hampden Township
Hanover Township
Harrisburg City
Highspire Borough
Hummelstown Borough
Huntingdon Borough
Jenkins Township
Jersey Shore Borough
Kelly Township
Kingston Borough
Kistler Borough
Larkesville Borough
Lebanon City
Lewisburg Borough
Lewistown Borough
Lock Haven City
Lower Allen Township
Lower Swatara Township
Loyalsock Township
Luzerne Borough
Mahoning Township
Mapleton Borough
Marysville Borough
Middletown Borough
Milesburg Borough
Mill Hall Borough
Monroe Township
Montgomery Borough

Pennsylvania - (Continued)

Montoursville Borough
Mount Union Borough
Muncy Borough
Nanticoke City
New Cumberland Borough
Northumberland Borough
North York Borough
Old Lycoming Township
Pine Creek Township
Pittston City
Plains Township
Plymouth Borough
Plymouth Township
Point Township
Porter Township
Pringle Borough
Renovo Borough
Riverside Borough
Royalton Borough
Sayre Borough
Shamokin Dam Borough
Shickshinny Borough
Smithfield Township
South Hanover Township
South Renovo Borough
South Williamsport Borough
Spring Garden Township
Spring Township
Springettsbury Township
Steelton Borough
Sunbury City
Susquehanna Township
Swoyersville Borough
Upper Augusta Township
West Chillisquaque Township
West Fairview Borough
West Lebanon Township
West Pittston Borough
West Wyoming Borough
Wilkes-Barre City
Williamsport City
Wormleysburg Borough
Wyoming Borough
York City

Maryland

Havre De Grace
Perryville
Port Deposit

FEDERAL AGENCIES

Carlisle Borough (SCS)
Milton Borough (COE)
Selinsgrove Borough (USGS)

SUSQUEHANNA RIVER BASIN COMMISSION

2. Underway Flood Insurance Studies

Pennsylvania

Archbald Borough
Armstrong Township
Athens Township
Avis Borough
Blakely Borough
Bloomsburg Town
Brady Township
Braintrim Township
Briar Creek Borough
Carbondale City
Catawissa Borough
Catawissa Township
Chapman Township
Clark Summit Borough
Cleveland Township
Clinton Township

Pennsylvania - (Continued)

Colebrook Township
Columbia Borough
Conestoga Township
Conoy Township
Delaware Township
Dickson City Borough
Duncannon Borough
Dunmore Borough
Duryea Borough
East Donegal Township
East Manchester Township
Eaton Township
Exeter Township
(Lycoming County)
Exeter Township
(Wyoming County)
Fairfield Township
Fermanagh Township
Franklin Township
Goldsboro Borough
Gregg Township
Halifax Borough
Hallam Borough
Hellam Borough
Hemlock Township
Herndon Borough
Howe Township
Hunlock Township
Jackson Township
(Northumberland County)
Jermyn Township
Jessup Township
Laceyville Borough
Little Mahanoy Township
Liverpool Borough
Locust Township
Londonderry Township
Lower Augusta
Lower Chanceford
Manor Township
Marietta Borough
Martic Township
Meshoppen Borough
Meshoppen Township
Middle Paxton Township
Mifflin Borough
(Juniata County)
Mifflin Township
(Columbia County)
Millersburg Borough
Montour Township
Moosic Borough
Mount Pleasant Township
Mount Wolf Borough
Nescopeck Borough
Nescopeck Township
Newberry Township
Newport Borough
Nippenose Township
Noyes Township
Old Forge Borough
Oliver Township
Olyphant Borough
Orange Township
Orangeville Borough
Penn Township
(Perry County)
Penn Township
(Snyder County)
Piatt Township
Port Royal Borough
Ransom Township
Reed Township
Ridgebury Township
Roaring Brook Township
Rye Township
Salem Township
Scott Township
Scranton City
South Centre Township
South Waverly Borough
Susquehanna Township
Taylor Borough
Throop Borough
Tunkhannock Borough
Turbett Township
Turbot Township
Union Township
Upper Paxton Township
Walker Township
Watsontown Borough
Watts Township
Wayne Township
Wheatfield Township
White Deer Township
Woodward Township
(Clinton County)
Woodward Township
(Lycoming County)
Wrightsville Borough

New York

Addison Village
Alfred Village
Almond Town
Almond Village
Arkport Village
Campbell Town
Elmira Heights Village
Hornell City
Hornell Town
Horseheads Town
Horseheads Village
Lindley Town
North Hornell Village
Savona Village
Waverly Village

PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES

1. Reservoirs	Drainage Area (Sq. Mi.)
Frances Slocum Dam - Flood Control	6.1
Glendale Dam - Flood Control, Recreation	42.0
George B. Stevenson Dam - Flood Control, Recreation	243.0
Little Pine Creek Dam - Flood Control, Recreation	165.4
Middle Creek Dam - Flood Control, Recreation	17.6
Shawnee Dam - Flood Control, Recreation	37.5

2. Local Flood Protection Projects

Athens (Susquehanna River) - Levee
Athens (Chemung River) - Levee
Barnesboro - Levee, Channel Improvement
Cherry Tree - Levee, Channel Improvement
Danville - Levee
Danville (Mahoning Creek) - Levee, Channel Improvement
Danville (Sechler Run)
Dickson City - Channel Improvement
Duryea - Channel Improvement
Emporium - Debris Dam, Channel Improvement
Everett - Levee
Galeton - Levee, Channel Improvement
Huntingdon-Smithfield - Levees
Huntingdon-Smithfield - Channel Improvement, Conduit, Debris Dam
Irvona - Levee
Mayfield - Channel Improvement
Milesburg - Channel Improvement
Milton - Stabilization
Mocanaqua - Channel Improvement
Moosic - Levees and Channel Improvement

Local Flood Protection Projects (Continued)

Olyphant - Channel Improvement
Patton - Channel Improvement
Philipsburg - Channel Improvement
Plymouth - Debris Dams and Culverts
Sayre - Levee and Channel Improvements
Sayre - Internal Drainage and Pumping Stations
Scranton - Channel Improvements and Culvert
Tioga - Levee and Channel Improvements
Wyoming - Channel Improvements

APPENDIX D

EFFECT OF RESERVOIRS
FLOOD OF RECORD PRIOR TO AGNES*

Location	Stream and Event	NWS Flood Stage (a)	Reduction From Natural Stage of Event Due to Reservoirs		Modified Stage of Event Exceeds NWS Stage (b)	
			Feet	Percentage	Feet	Percentage
(1) Unadilla, N.Y.	Susquehanna 1936	11	.70	4	4.1	37
(1) Conklin, N.Y.	Susquehanna 1936	11	.20	1	8.9	81
(2) Whitney Pt., N.Y.	Tioughnioga 1935	12	3.20	15	6.5	54
Chenango (2) Forks, N.Y.	Chenango 1935	10	1.60	8	8.7	88
(4) Elmira, N.Y.	Chemung 1946	10	.30	1	10.9	110
(3) Vestal, N.Y.	Susquehanna 1936	18	2.70	9	9.8	55
(4) Hornell, N.Y.	Canisteo 1935	9 (c)	7.40	43	1.0	11
(4) West Cameron, N.Y.	Canisteo 1935	17	.60	3	3.2	19
(4) Corning, N.Y.	Chemung 1946	16	.40	2	8.0	50
(4) Chemung, N.Y.	Chemung 1946	12	.40	2	11.6	80

* Adapted from the Baltimore District, Corps of Engineers' Master Manual for Reservoir Regulations in the Susquehanna River Basin, Volumes I and II.

APPENDIX D (Cont'd)

Location	Stream and Event	NWS Flood Stage (a)	Reduction From Natural Stage of Event Due to Reservoirs		Modified Stage of Event Exceeds NWS Stage (b)	
			Feet	Percentage	Feet	Percentage
(5) Towanda, Pa.	Susquehanna 1946	16	.50	2	8.9	56
(6) Archbald, Pa.	Lackawanna 1942	8	1.1	10	1.5	19
(6) Old Forge, Pa.	Lackawanna 1955	11	.50	3	8.5	78
(7) Danville, Pa.	Susquehanna 1936	20	.8	3	6.6	33
(8) Clearfield, Pa.	West Branch Susquehanna 1936	10	11.0	63	-3.5	-35
(9) Renovo, Pa.	West Branch Susquehanna 1936	16	5.4	18	8.0	50
(9) Lock Haven, Pa.	West Branch Susquehanna 1936	21	3.6	11	7.7	37
(10) Williamsport, Pa.	West Branch Susquehanna 1936	20	6.4	19	7.2	36
(10) Lewisburg, Pa.	West Branch Susquehanna 1936	18	4.8	15	9.3	46
(11)(d) Sunbury, Pa.	Susquehanna 1936	24	2.4	7	8.3	35
(12) Harrisburg, Pa.	Susquehanna 1936	17	2.0	7	10.2	60
(13) Mapleton Depot, Pa.	Juniata 1936	20	11.2	29	7.0	35

Location	Stream and Event	NWS Flood Stage (a)	Reduction From Natural Stage of Event Due to Reservoirs		Modified Stage of Event Exceeds NWS Stage (b)	
			Feet	Percentage	Feet	Percentage
(13) Newport, Pa.	Juniata 1936	22	7.7	23	4.5	20

Modified By

(1) East Sidney

(2) Whitney Point

(3) (1) and (2)

(4) Arkport and Almond

(5) (3) and (4)

(6) Stillwater and Aylesworth Creek

(7) (3), (4) and (6)

(8) Curwensville

(9) Stevenson, Bush and Curwensville

(10) (9) and Sayers

(11) (7) and (10)

(12) (11) and Raystown

(13) Raystown

(a) NWS Flood Stage: Elevation at which water begins to overtop bank and some minor damage may occur.

(b) Modified Stage of Event: Stage which results from the reduction of the natural stage by reservoirs.

(c) NWS value not available; represents Corps of Engineers' critical stage value.

(d) Gage relocated in 1968.

APPENDIX E

EFFECT OF RESERVOIRS
AGNES - JUNE 1972*

Location	Stream	NWS Flood Stage (a)	Reduction From Natural Stage of Event Due to Reservoirs		Modified Stage of Event Exceeds NWS Stage (b)	
			Feet	Percentage	Feet	Percentage
(1) Unadilla, N.Y.	Susquehanna	11	.23	3	-3.13	28
(1) Conklin, N.Y.	Susquehanna	11	.11	1	1.89	17
(2) Whitney Pt., N.Y.	Tioughnioga	12	2.10	13	2.3	19
(2) Chenango Fks,N.Y.	Chenango	10	1.51	12	1.19	12
(3) Vestal, N.Y.	Susquehanna	18	1.85	8	4.35	24
(4) Hornell, N.Y.	Canisteo	9(c)	8.55	39	4.45	39
(4) W. Cameron, N.Y.	Canisteo	17	.92	4	6.48	38
(4) Chemung, N.Y.	Chemung	12	.38	1	19.62	163
(5) Towanda, Pa.	Susquehanna	16	.47	1	17.43	109
(6) Archbald, Pa.	Lackawanna	8	1.11	15	-1.91	-24

* - Adapted from the Baltimore District, Corps of Engineers' Master Manual for Reservoir Regulations in the Susquehanna River Basin, Volumes I and II.

APPENDIX E (Cont'd)

Location	Stream	NWS Flood Stage (a)	Reduction From Natural Stage of Event Due to Reservoirs		Modified Stage of Event Exceeds NWS Stage (b)	
			Feet	Percentage	Feet	Percentage
(6) Old Forge, Pa.	Lackawanna	11	.32	4	2.22	20
(7) Danville, Pa.	Susquehanna	20	.58	2	12.32	62
(7) Wilkes-Barre, Pa.	Susquehanna	22	.59	46	18.91	86
(8) Clearfield, Pa.	West Branch Susquehanna	10	5.27	38	-1.27	-13
(8) Karthaus, Pa.	West Branch Susquehanna	19	2.13	10	- .43	- 2
(9) Renovo, Pa.	West Branch Susquehanna	16	3.84	13	10.56	66
(9) Lock Haven, Pa.	West Branch Susquehanna	21	2.50	7	10.30	49
(10) Williamsport, Pa.	West Branch Susquehanna	20	5.25	10	14.75	74
(10) Lewisburg, Pa.	West Branch Susquehanna	18	4.17	11	16.23	90
(11)(d) Sunbury, Pa.	Susquehanna	24	1.70	5	11.80	49
(12) Mapleton Depot, Pa.	Juniata	20	4.63	12	13.07	65
(12) Newport, Pa.	Juniata	22	3.33	9	11.97	54
(13) Harrisburg, Pa.	Susquehanna	17	1.93	6	15.57	92

Modified By

(1) East Sidney

(2) Whitney Point

(3) East Sidney and Whitney Point

(4) Arkport and Almond

(5) (3) and (4)

(6) Stillwater and Aylesworth Creek

(7) (5) and (6)

(8) Curwensville

(9) Curwensville, Stevenson and Bush

(10) (9) and Sayers

(11) Reservoirs in (5) and (6)

(12) Partially completed Raystown

(13) (11) and (12)

(a) NWS Flood Stage: Established elevation at which water begins to overtop bank and some minor damage may occur.

(b) Modified Stage of Event: Stage which results from the reduction of the natural stage by reservoirs.

(c) NWS value not available: represents Corps of Engineers' critical stage value.

(d) Gage relocated in 1968.

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BOOKBINDING
MIDDLETOWN, PA.
JUNE 76
We're Quality Bound